THE REFINER AND NATURAL GASOLINE MANUFACTURER

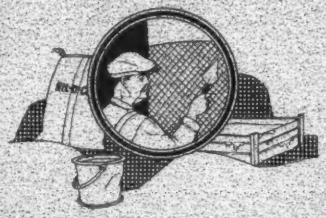
NOVEMBER, 1926

NEWS INDEX - - - 19
ADVERTISERS INDEX - 90

VOLUME 5 NUMBER 11

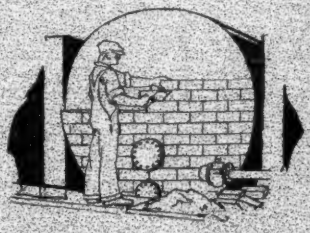
A Comprehensive Service

THERE is a form of Sil-O-Cel insulation exactly suited to the structural and temperature requirements of every piece of equipment in which heat is used.

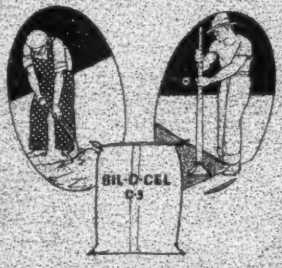


Sil-O-Cel insulating cements can be molded into any required form or applied to any irregular surface.

For the insulation of steel surfaces Sil-O-Cel Standard or "split" brick are ordinarily cemented direct to the steel, anchored, and covered with a protective coating of hard finish cement.

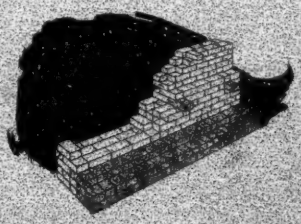


Monolithic insulated construction that is also semi-refractory is readily attained by mixing Sil-O-Cel C-3 with portland cement and water to form Sil-O-Cel C-3 concrete.



Sil-O-Cel insulating brick, of standard fire brick dimensions, are also employed for the insulation of still and boiler settings, where they replace fire brick or red brick behind the refractory lining. Three grades are supplied, to cover all temperature requirements.

Sil-O-Cel block is available in various thicknesses, to meet all requirements for block insulation.



Write for "The Logic of Insulation", Bulletin R-137, which tells where and how heat insulation is being used today to save fuel and improve temperature control. Address Celite Products Company, 11 Broadway, New York, or 53 West Jackson Blvd., Chicago, or 140 Spear St., San Francisco.

SIL-O-CEL
HEAT INSULATION

BRAUN BUBBLE TOWERS

A TYPICAL TEST ON ONE OF FIVE BRAUN BUBBLE STILLS

(1) Size—diameter 32 in., height 10 ft.
(2) 7000 gals. gasoline daily
(3) 84000 gals. absorption oil
(4) Strip to ZERO gasoline in lean oil
(Bureau of Mines Standard Atmospheric Distillation Test)

Send for Bulletin 123

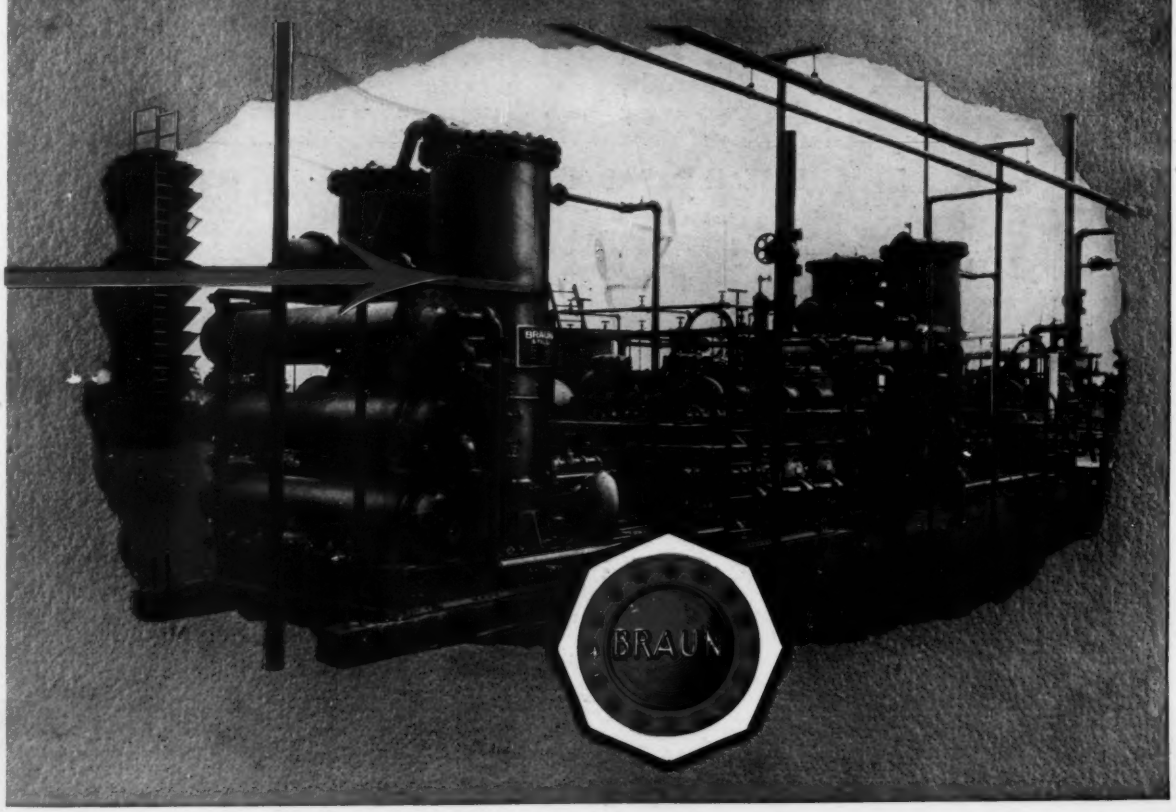
C. F. BRAUN & CO.
Manufacturing Mechanical Engineers
Tulsa Alhambra, Calif. Dallas

BRAUN

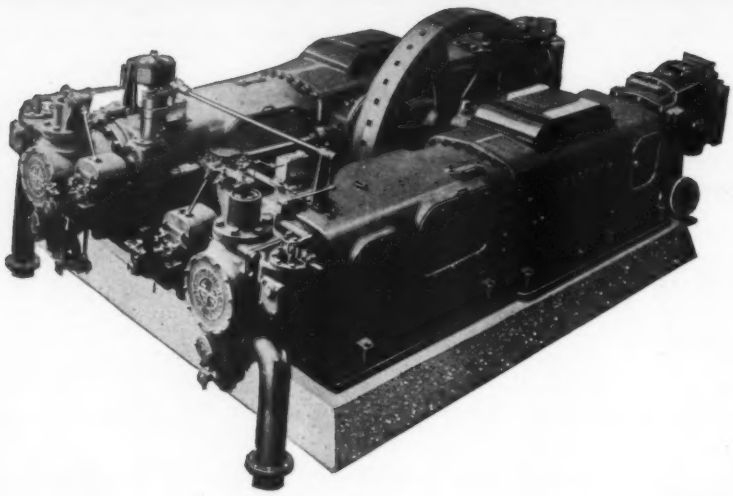
Entered as second class matter June 16th, at the Postoffice at Houston, Texas, under the Act of March 3, 1879.

Announcement

C. F. Braun & Co., after years of research on interfacial contact apparatus, is now manufacturing Bubble type towers, including stills, absorbers, rectifiers, etc. This equipment incorporates revolutionary improvements in design and shows startling results in performance.



Mention Where You Saw the Advertisement



All that a Compressor should be

THERE are compressors and compressors, but a Bessemer Compressor stands out as the one unit that gives the utmost in performance, operating efficiency and lasting service.

Performance has proved that any type of Bessemer Compressor (two cycle direct driven, four cycle direct driven or belt driven) gives the utmost in service on the job. Each Bessemer has exceptional strength built into the bed plate, cylinders, connecting rods, crank-shafts, bolts, and nuts. Every bearing, bushing and wearing surface is oversize to insure Bessemers *extra* years of service. Every part is adjustable and easily accessible to permit quick adjustments when necessary, all compressor cylinders are of the improved Bessemer V. H. Type which deliver an unequaled compressor efficiency.

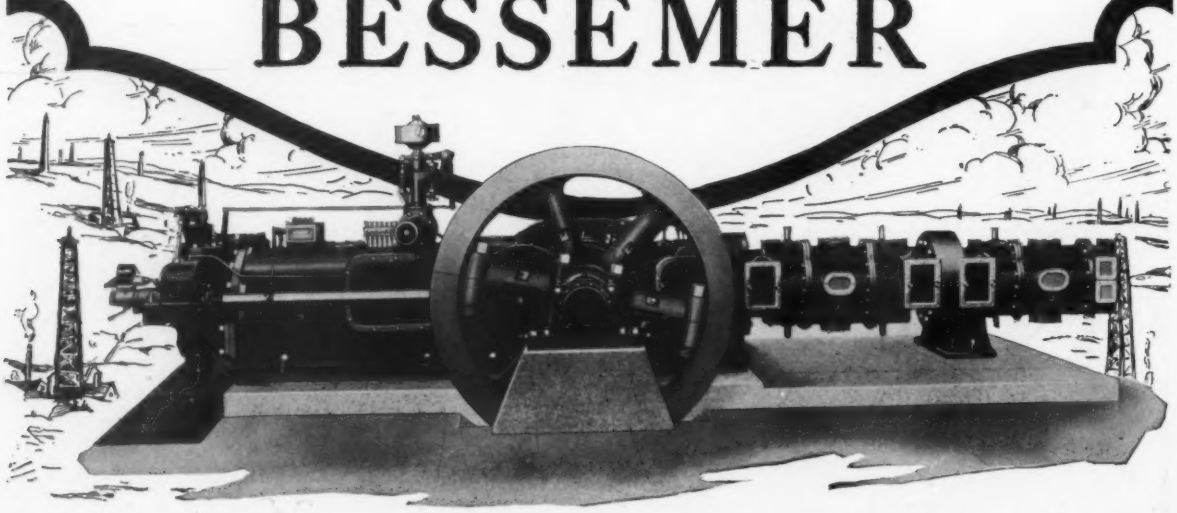
Every engineering and construction feature of every Bessemer Compressor is a reason for Bessemers longer service, lower upkeep and greater efficiency of performance in service. That's why Bessemers are the standard of the Natural Gasoline Industry.

THE BESSEMER GAS ENGINE COMPANY

18 York Street ∴ ∴ Grove City, Pa.

California Branch—727-728 Standard Oil Bldg., Los Angeles
California Distributor: Associated Supply Co., San Francisco—Los Angeles

BESSEMER



Mention Where You Saw the Advertisement

PITTSBURGH SEAMLESS

Pittsburgh Seamless Tubes Serve the Oil Industry

The severe service encountered in both production and refining branches of the oil industry calls for the best in tubular goods. The greater strength and ultimate economy of Pittsburgh Seamless Tubes is reflected in the tremendously increased use of them in oil country work.

Pittsburgh Seamless
Boiler Tubes and Still Tubes

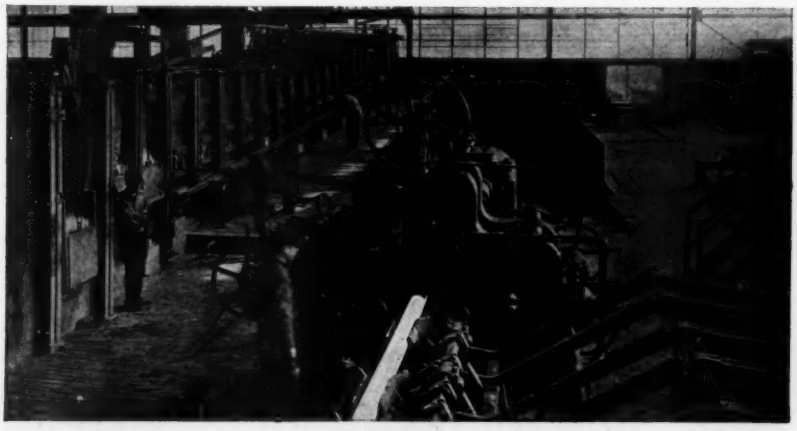
are used extensively in the refining branch of the oil industry and have proven eminently satisfactory. Our recently enlarged manufacturing and distribution facilities serving the industry insure uniform quality and the prompt supplying of your needs. Our products include boiler tubes, still tubes, casing, tubing and drill pipe of basic open hearth seamless steel exclusively. Inquiries given prompt attention.

Pittsburgh Steel Products Co.
Pittsburgh, Pa.

New York — Second Nat'l Bank Bldg., Houston, Tex.

Detroit

Chicago — Atlas Life Bldg., Tulsa, Okla.



Piercing Billet

-but there was no need to worry about the tanks---

Fire has danced and played all around Oceco Equipped tanks and never once has it gotten through an Oceco Flame Arrestor. Build gas-tight tankage and equip with Oceco—that eliminates worry and disaster.

THE OIL CONSERVATION ENGINEERING COMPANY

Headquarters for Tank Equipment

877 Addison Road Cleveland, Ohio

Engineering and Sales Service at:

25 Broadway, New York

4171¼ Boulder St., Tulsa, Okla.

O-SBuilding, Casper, Wyo.

W. K. Henderson Co., Shreveport, La.

Neilan, Schumacher & Co., Los Angeles, Cal.

Arthur Dooley, Box 552, Beaumont, Texas

6" Type B Vent Unit

These tanks are OCECO Equipped

The Holmes-Manley *Cracking* Process

Through unique features and positive control, this process is pre-eminent in its production of quality gasoline.

The Licensee receives:—

1. *A Proven Process*
2. *Complete Technical Service*
3. *The Benefit of Future Developments*

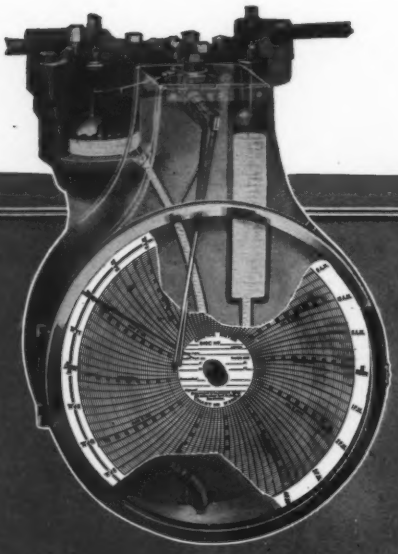
Licenses Granted by

THE TEXAS COMPANY, U. S. A.

Apply to

W. S. S. RODGERS

17 Battery Place, New York, N. Y.



"No type of volume measuring apparatus has received so much attention as the simplest form of velocity meter, the ORIFICE meter. This type meter, with differential gauge, has proven to be the most accurate and dependable apparatus designed for the measurement of gases and liquids flowing in pipe lines.

"Many simple and complicated forms of velocity meters have been designed, but up to the present time, none has obtained any advantage over the ORIFICE, except at the expense of those most fundamental qualities —accuracy and dependability."

Quoted from Westcott's "Measurement of Gas and Liquids by Orifice Meter"
—Second Edition

METERS

Mention Where You Saw the Advertisement

The sun pump
that robs your storage tanks

WARM days and cool nights conspire and co-operate to pump valuable gasoline from your storage tanks. By keeping tank temperature more uniform you cut down evaporation loss. Johns-Manville Vapor Tight Insulated Tank Tops* keep the interior of the tanks at an even temperature. They seal the roof and eaves so that vapor cannot escape by wind drift.

Tanks equipped with Johns-Manville Vapor Tight Insulated Tank Tops* mean real economy.

*Patented, other patents pending

JOHNS-MANVILLE Inc., 292 Madison Ave. at 41st St., New York
Branches in all large cities
For Canada: CANADIAN JOHNS-MANVILLE CO., Ltd., Toronto

Through—
Asbestos
and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE
Oil Industry Department

Mention Where You Saw the Advertisement

SAFEMCO

PAINTS

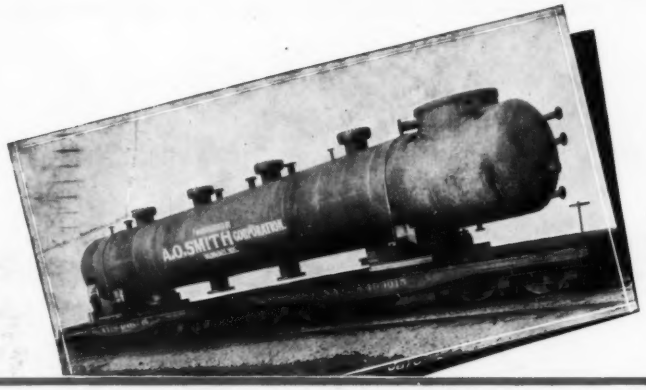
Made Especially
for the
Oil Industry

Used Successfully throughout
the South and Southwest

AMERICAN
PAINT & SUPPLY COMPANY

DALLAS, TEXAS

Mention Where You Saw the Advertisement



Picturing One Year of Progress

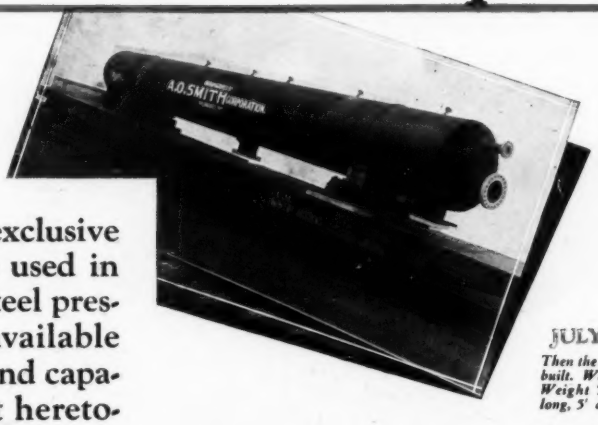
JULY 15, 1926

Largest ever built. Walls 3½" thick. Weight 268,800 lbs. 65' long, 8' diameter.

Any Wall Thickness Required!

MAY 30, 1926

Then the largest still ever built. Walls 2⅝" thick. Weight 144,000 lbs. 65' long, 6' diameter.



JULY 25, 1925

Then the largest still ever built. Walls 2½" thick. Weight 76,000 lbs. 41' long, 5' diameter.

The entirely new and exclusive methods of manufacture used in the production of Smithsteel pressure vessels have made available for the oil industry sizes and capacities in such equipment heretofore considered unobtainable.

In step with the progress being made in refinery methods Smithsteel Cracking Stills are being supplied in ever increasing dimensions —"in any diameter, of any length, to withstand any specified pressures to meet all operating conditions."

A. O. SMITH CORPORATION

TULSA *Milwaukee, Wis.* LOS ANGELES

SMITHSTEEL
CRACKING STILLS

They can take punishment and keep going—

The ability to fight does not make the prize-fighter a champion. He must also be able to stand up under his opponent's most murderous punches and be ready for more.

Lagonda Tube Cleaners come out Champions in their fight against scale in boiler and pressure still tubes. Knowing no limitations, they can withstand the punishment they receive and always are ready to go back in the tubes for more.

The opponent—Scale—may be hard, but Lagonda Cleaners always deliver the knockout blow. They are fast and they have the stamina.

All Champions have followers. Lagonda Cleaners have them in refineries everywhere. If you are not acquainted with these aggressive scale fighters, write for a copy of Catalog X-9. It tells all about them.

LAGONDA TUBE CLEANERS

Besides cleaners for all tubes, pipes, etc., Lagonda makes Tube Cutters, Boiler Cap and Header Reseaters and a Cleaner Feeding Device for Curved Tube Boilers.

The Lagonda Mfg. Co.
SPRINGFIELD, OHIO.
FUEL SAVING SPECIALISTS
NEW YORK, CHICAGO, PHILADELPHIA, BOSTON, PITTSBURGH, CLEVELAND CINCINNATI, DETROIT, SYRACUSE, BALTIMORE
ST LOUIS, KANSAS CITY, DENVER, DALLAS, ATLANTA, SAN FRANCISCO, MONTREAL, LONDON.

A gas cooler that saves space--labor--operating cost

Note these other G-R Units for lower refining costs

G-R Sectional Condenser

For condensing hydrocarbon vapors and other vapors

Can be used either as a standard or reflux condenser. The sectional arrangement permits using as a condenser and heat exchanger in one set or to obtain a different cut from each section.

Mineral Seal Oil Heat Exchangers

A compact, twin exchanger with strict counter-current flow to promote maximum of heat interchange.

G-R Jacket Water Cooler

Uses any source of raw water to cool the jacket water from oil and gas engines and compressors. The famous Multiwhirl Cooler—over 2000 in operation in every liquid cooling service.

G-R Gasoline Condenser

For condensing natural gasoline vapors in casinghead gasoline plants. Can also be used as a knockout box or fractionating tower control section with particularly close control of the end points.

G-R Twin Heat Exchanger

For the efficient interchange of heat between crude oil feed stock and still bottoms, cold water and hot oil, feed stock and hot still vapors, etc.

The G-R Vaneflo Gas Cooler

can be operated as an inner-, after-, or pre-cooler for casinghead gas and is especially adapted to absorption and compression type natural gasoline plants.

This cooler saves space because its counter-current flow of gas and water, high rate of heat transfer, and the twin design in which it can be furnished result in the most compact construction, and highly efficient designs.

It saves labor because built so as to be easy to inspect, easy to clean, easy to erect, and easy to transport to new locations as required by changing plant conditions.

It saves operating cost because of its low gas pressure drop, sturdy, durable, trouble-proof construction, and highly efficient design.

THE GRISCOM-RUSSELL COMPANY

Dept. K, 285 Madison Avenue

Philadelphia	Columbus		Kansas City	San Francisco
Boston	Indianapolis		Charlotte	Los Angeles
Rochester	Detroit		New Orleans	Seattle
Pittsburgh	Milwaukee		Houston	Denver
Cleveland	Minneapolis		Dallas	Salt Lake City
Chicago	St. Louis		Atlanta	Tulsa

For Canada: Riley Engineering and Supply Co., Ltd., Toronto

Send the Coupon for Full Information

Griscom-Russell

Heat Transfer Apparatus

The Griscom-Russell Company,
Dept. K, 285 Madison Ave., New York.
Please send information on
( ) ( ) Vaneflo Gas Cooler ( ) ( ) Mineral Seal Oil Heat Exchanger
( ) ( ) Jacket Water Cooler ( ) ( ) Gasoline Condenser
( ) ( ) Twin Heat Exchanger ( ) ( ) Sectional Condenser
Name.....
Address.....
R 11-26

Mention Where You Saw the Advertisement

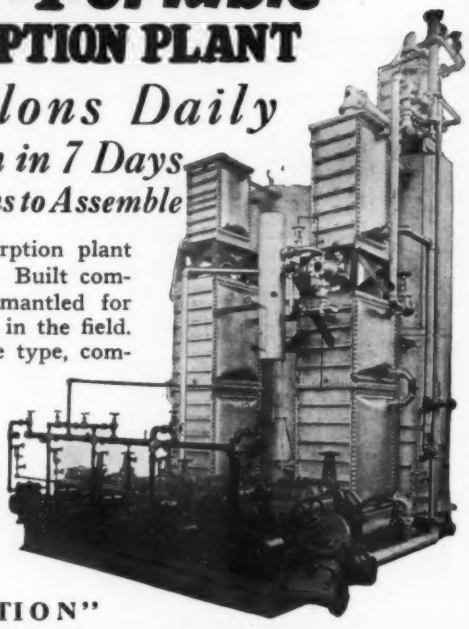
There are 76 "Southwestern" Portable Absorption Plants now in successful operation throughout the country.

"Southwestern" Semi-Portable ABSORPTION PLANT

7500 Gallons Daily

On Production in 7 Days

Only Three Sections to Assemble



A large factory built standardized semi-portable absorption plant of 7500 gallons of gasoline normal capacity rating. Built complete at factory—thoroughly tested—then partially dismantled for shipping. All units fitted and piped for quick assembly in the field. This new plant is a logical development of the portable type, combining quick installation with the large capacity and efficiency of the permanent plant at a much lower cost.

SOUTHWESTERN ENGINEERING CORPORATION

1221 HOLLINGSWORTH BLDG. LOS ANGELES, CALIF.

837 Mayo Building, Tulsa, Okla.

Suite A, Western Bldg., Amarillo, Texas

Factory: Culver City, Calif.

Branch Factory: Tulsa, Okla.

"SOUTHWESTERN *for* SATISFACTION"

HEAVY DUTY EXPANDERS FOR STILL TUBES

TOOLS FOR THE OIL INDUSTRIES

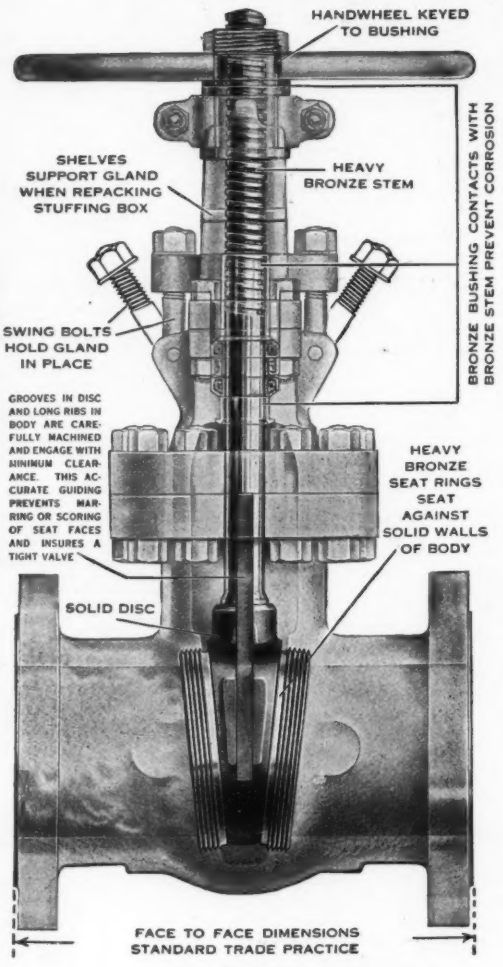
Hydraulic Pressure Pumps, 8000 pounds
Tube Expanders for Cracking Still Tubes
Hydraulic Pressure Pumps, 2000 pounds.
Tube Expanders for Condenser Tubes
Hydraulic Pressure Pumps, 500 pounds.
Tube Expanders for Steam Boilers
Screw Punches for Structural Shapes
Tube Expanders for Pipe Work
Screw Punches for Plate Work
Flaring Tools for Still Tubes
Beading Tools for Still Tubes
Hydraulic Jacks
Hydraulic Punches

A. L. Henderer's Sons

Wilmington, Del.

Established 1870 Expanders since 1884

Inside Facts—


HANDWHEEL KEYED TO BUSHING
SHELVES SUPPORT GLAND WHEN REPACKING STUFFING BOX
HEAVY BRONZE STEM
BRONZE BUSHING CONTACTS WITH BRONZE STEM PREVENT CORROSION
SWING BOLTS HOLD GLAND IN PLACE
GROOVES IN DISC AND LONG RIBS IN BODY ARE CAREFULLY MACHINED AND ENGAGE WITH MINIMUM CLEARANCE. THIS ACCURATE GUIDING PREVENTS MARRING OR SCORING OF SEAT FACES AND INSURES A TIGHT VALVE
HEAVY BRONZE SEAT RINGS SEAT AGAINST SOLID WALLS OF BODY
SOLID DISC
FACE TO FACE DIMENSIONS STANDARD TRADE PRACTICE

LUNKENHEIMER
IRON BODY BRONZE MOUNTED GATE VALVE

Standard .....125 lb. W. S. P. 2 to 24 in.
Heavy .....175 lb. W. S. P. 2 to 16 in.
Extra Heavy...250 lb. W. S. P. 1½ to 18 in.

Also procurable in the Quick Operating Pattern, and in the All-Iron Pattern for handling solutions which attack bronze but not iron.

Which are influencing discerning valve users to insist upon the installation of

LUNKENHEIMER

Iron Body Bronze Mounted Gate Valves

The sectional view shows at a glance the simplicity of design, the rigid construction, and the careful attention to manufacturing details—all of which finally determine service results and ultimate valve costs.

Is it any wonder, then, that operating executives who have experienced endless trouble and expense trying to keep their gate valves tight, have enthusiastically accepted the Lunkenheimer design as a worth-while development in gate valve construction, and a solution of their gate valve problems?

Wherever Lunkenheimer Gate Valves have been installed, they are aiding materially in reducing operating costs, because they require very little attention after installation; they stay tight, and maintenance expense is held to a minimum.

Lunkenheimer manufacturing facilities insure a complete stock of all sizes at all times. Distributors are located in all oil producing centers and can fill your requirements promptly from stock.

Complete information is contained in Gate Valve Book, F. 511, a copy of which will be sent upon request without any obligation on your part.

JUST FILL IN AND MAIL THE COUPON

AMERICA'S BEST LUNKENHEIMER "QUALITY" SINCE 1862

THE LUNKENHEIMER CO.
"QUALITY"
CINCINNATI, OHIO, U. S. A.
NEW YORK CHICAGO BOSTON LONDON
EXPORT DEPT. 129-135 LAFAYETTE ST., NEW YORK

THE LUNKENHEIMER CO. "QUALITY"
P. O. Box 876 Cincinnati, Ohio
Gentlemen—Send me without obligation, copy of Gate Valve Book No. 511. J
Name_____
Firm_____
Position_____
Address_____

6-46-89

The M. W. Kellogg Co.

takes pleasure in announcing it has been appointed Sales Agent for the GRAY VAPOR PHASE TREATING PROCESS in connection with cracking installations.

THE M. W. KELLOGG CO.
7 Dey St., New York City.

Branch Offices:
700 Baltimore Ave., Kansas City, Mo.
444 Market St., San Francisco, Calif.
1019 Hellman Bank Bldg., Los Angeles, Calif.

Mention Where You Saw the Advertisement

Dont Fail To See The Latest

Vogt *DROP FORGED STEEL* Valves

With INTEGRAL FORGED FLANGES

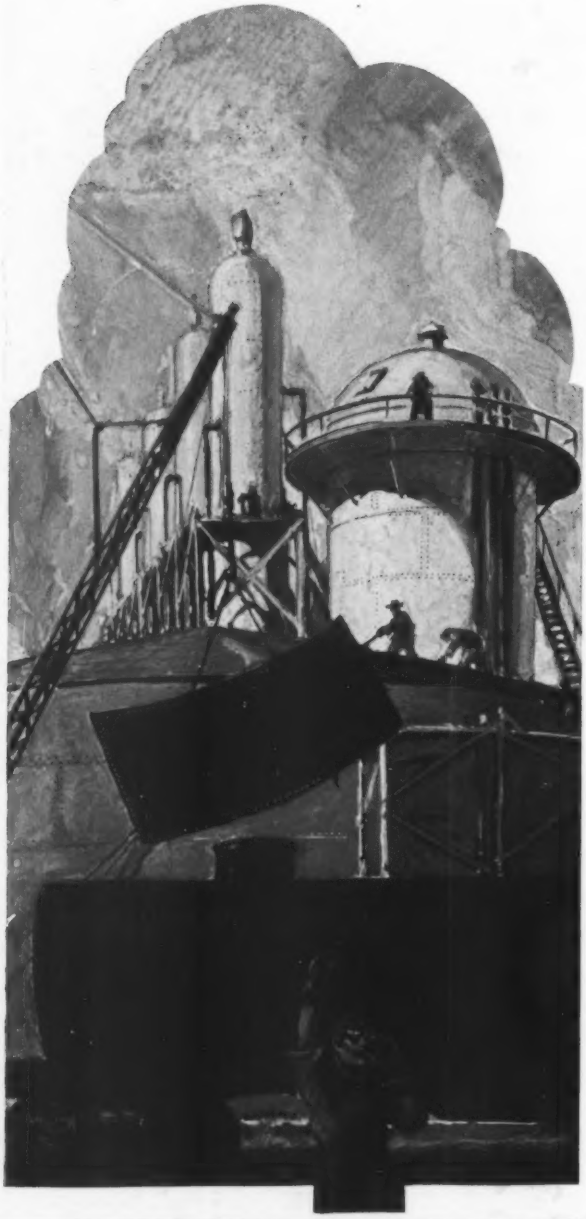
at the POWER SHOW-DEC. 6-11- GRAND CENTRAL PALACE NEW YORK.

HENRY VOGT MACHINE CO.
INCORPORATED
LOUISVILLE, KY.

New York Chicago Philadelphia Cleveland Dallas

Manufacturers of: OIL REFINERY EQUIPMENT, DROP FORGED STEEL VALVES AND FITTINGS, WATER TUBE AND HORIZONTAL RETURN TUBULAR BOILERS, ICE MAKING AND REFRIGERATING MACHINERY.

Quick Shipment



No matter how large or how small your order or what your requirements may be, you are assured quick shipment from KAW.

SKILLED WORKMEN—

Our large force of highly skilled workmen enables us to turn out all kinds of refinery equipment jobs in record time. If there is a hurry-up call on a special job this corps of men are trained to turn it out in speedy fashion.

MODERN MACHINERY—

Our late model machinery of the KAW plant is work-saving machinery. It makes possible work as quickly done as it is accurately done.

FAVORABLE LOCATION—

The KAW plant and general office is adjacent to many railroad yards. Freight lines running to all parts of the country are right at our front door.

KAW leadership has been builded through Service. Service in constructing as good refinery equipment as can be produced. Service in shipping this equipment when refinery men want it. KAW specifications and prices will prove that we can serve **you** better. Write, wire or phone!

The Kaw Steel Construction Co.

General Office and Plant:
1st and Walker Ave. Kansas City, Kansas.

Standard Equipment

We keep a large stock of standard equipment on hand all the time to meet every day demand.

Special Specification Jobs

We are prepared to meet your requirements for any kind of special specification jobs at any time you want them.

Vol. 5, No. 11

NOVEMBER, 1926

The REFINER

AND NATURAL GASOLINE MANUFACTURER

Edited Monthly at Tulsa, Oklahoma — GRADY TRIPLETT, *Editor*

TABLE OF CONTENTS

EDITORIAL COMMENT 21
By Grady Triplett
MID-CONTINENT REFINERS SEEK LOWER RATES TO NORTHEAST 23
By Grady Triplett
WADE HYDROGENATING PLANT IN OPERATION 24
ELIMINATION OF WASTE IN REFINING PETROLEUM 26
By Charles G. Rebman
GETTING FINISHED CUTS FROM SINGLE TOWER 29
By George Reid
COOLING AS APPLIED TO NATURAL GASOLINE PLANTS 33
By H. J. Maxwell
TABLE OF MATERIAL AND LABOR BASIS FOR CONSTRUCTION WORK 34
By Alexander B. Morris
CRACKING HEAVY HYDROCARBONS IN THE PRESENCE OF CATALYST 42
By Ismar Gingsberg
MORE LIGHT AT LOWER COST 36
By Ralph Good
BARREL DRYING ROOM OF SIMPLE DESIGN 46
By H. L. Kauffman
FIVE RUNGS ON THE PROGRESS LADDER 48
By Otto Peters
PRESSURE EQUIPMENT REQUIRES EXPERT INSPECTION 44
By Franklin L. Newcomb
CHARCOAL ABSORPTION—THEORETICAL CONSIDERATIONS 74
By A. J. L. Hutchinson
RECOVERING INORGANIC DECOLORIZING POWDERS 54
By Ismar Ginsberg
RESULTS OF RETORTING WYOMING BITUMINOUS COAL 56
RECENT ITEMS IN PLANT EQUIPMENT 66
ABSTRACTS OF REFINING TECHNOLOGY 81
TILE WALLS PROTECT REFINERY TANKS 52
By Roye Munsell
RECENT REFINERY PATENTS 78

Published Monthly by GULF PUBLISHING COMPANY, INC.
Copyrighted, 1926
R. L. DUDLEY, *President* — A. L. BURNS, *General Manager*

Office of Publication: 1716 Dallas Avenue, Houston, Texas

CHICAGO: 476 First Nat'l Bank Bldg., O. R. Waller, Manager. *LOS ANGELES:* 1201 Haas Bldg., Wm. V. Gross, Manager. *TULSA:* 215-16 Atco Bldg., J. F. Carter, Jr., Manager. *FORT WORTH:* 203 W. T. Waggoner Bldg., H. H. King, Manager. Single Copies 20 cents. Domestic Subscription price, $1.00 a year. Foreign Subscription price, $1.50 a year. Advertising rates upon application.

MIDWAY'S VENTURA PLANT BUILT WITH COOPER ENGINES

AMONG the companies which are proud of their compressor stations—

Why do so many of them use Cooper gas engines?

The best explanation is the one given by the manager of a nationally known oil company. He once called the attention of a visitor to the manner in which his company installed such a simple thing as a pumping power. He said, "We use the best one we can get, then install it as though we expected it to stay there forever. Accurate operating and maintenance records have proved to us that our policy is steadily reducing our production costs."

His company has installed twenty-seven twin 170 horsepower Cooper compressors already this year.

The C. & G. Cooper Company

HOME OFFICE, MT. VERNON, OHIO

1605 Kirby Bldg., Dallas

504 Kennedy Bldg., Tulsa, Okla.

649 South Olive St., Los Angeles, Calif.

COOPER

Mention Where You Saw the Advertisement

EDITORIAL COMMENT

Signs of Progress

NO movement in refining circles offers greater assurance of progressive development than the exchange of scientific knowledge at open meetings of refinery engineers.

Refining engineers have been hampered in the past because of conditions within the refining industry. Even yet it is not possible for all phases of refining to be brought into open discussion.

But there are phases of refining progress that are open to common discussion. And it is the advantage being taken of this that offers the hope of progress.

The latest meeting of this sort was that of the Mid-Continent chapter of the American Society of Mechanical Engineers in Tulsa, October 29. One night of this program was devoted to the general subject of "Waste in the Refining of Petroleum."

An excellent paper by Charles G. Rebman was followed by discussion by some of the leading refining engineers of the petroleum industry.

Perhaps credit should be given to the Association of Natural Gasoline Manufacturers for breaking the way in this movement. Its annual conventions are opportunities for the exchange of technical knowledge of the making of natural gasoline.

Both the Western Petroleum Refiners Association and the National Petroleum Association devote a share of annual convention programs to technical discussions. These bodies also have other meetings of plant superintendents, where refining plants are visited and equipment and methods discussed.

The last meeting of the American Institute of Mining and Metallurgical Engineers in New York was the occasion for a free discussion of certain phases of refining engineering and practice.

On the Pacific Coast the California Natural Gasoline Association has gone further than any other organization in the frequency of such meetings. Once a month the engineers of the natural gasoline industry meet to hear papers and to discuss the subjects presented.

They may be other evidence of the tendency toward free exchange of refining technical knowledge. Any such effort is worthy.

While restrictions still prevail, which prevent all subjects from coming before such meetings, the tendency is toward more liberal methods. This is as much as can be asked.

Other engineering phases of the petroleum industry have found such practice valuable. In particular the geological profession through the A. I. M. A. M. E. and the American Association of Petroleum Geologists have been instrumental in providing common exchange of knowledge.

It is to be hoped that engineers of the refining industry will continue along present lines until their whole knowledge will come to be something of common property.

A Husky Infant

THE magnitude of the business of making and selling gasoline is now such that it is difficult to believe that the gasoline engine is only 40 years old. But such are the facts, according to the Illinois Chamber of Commerce, which has given out the following statment:

"One of the startling contrivances at the Centennial exposition in Philadelphia in 1876 was a mechanical marvel, an engine that ran on gas. It greatly impressed J. B. Williams and B. E. Orton who operated a machine shop in Sterling. Gasoline was a waste product then; run into streams or burned in flares to get rid of it. If an engine could run on gas, why not on gasoline?

"When Orton and Williams went to work on the ancestor of all gasoline engines, which it took them 10 years to perfect, John D. Rockefeller was only 36 years old and Standard Oil, as a trust, was not to be born for another six years. Henry Ford was 13, a schoolboy in Greenfield, Mich. Harry F. Sinclair was born that year. Yet how the gasoline engine was to effect their fortunes.

"Henry Berger, a Sterling mechanic, now dead and gone and little rewarded while he lived, is credited with doing more than any other man to bring that first gasoline engine into existence. The first engine, a stationary one, was sold to Lawrence Bros. of Sterling, makers of builders' hardware, and it ran in their shop until 1892 when it was yanked out for one of newer design."

Yes!

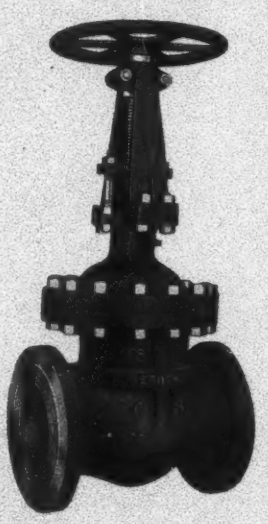
You Can Get Genuine Stainless Steel Trimmings in Kerotest Refinery Valves

Stainless Steel, the wonder metal you have all heard about—the steel that is absolutely impervious to rust or corrosion can be used if desired, in all the vital valve parts of Kerotests—the pre-eminent high pressure, high temperature valves of the Refinery Industry.

Kerotest Refinery Valves are made to withstand every pressure and temperature requirement.

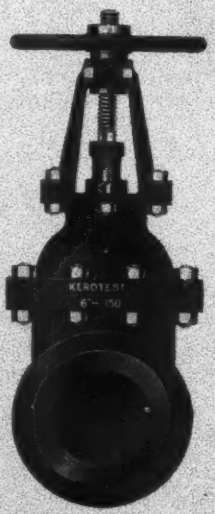
Tough, close grained, ilmenite electric cast steel—makes possible this super-strength.

Write for the Kerotest Folder describing the specifications and dimensions of this better line of Refinery Valves.



Kerotest Valve Series 300

Series 150—
150 lb. pressure at 750°
Series 250—
250 lb. pressure at 750°
Series 300—
300 lb. pressure at 750°
Series 400—
400 lb. pressure at 750°
Series 600—
600 lb. pressure at 750°
Series 900—
900 lb. pressure at 750°



Kerotest Valve Series 150

Kerotest Manufacturing Company

2525 Liberty Avenue

Pittsburgh Penna.

KEROTEST

REGISTERED U. S. PAT. OFF.

Mid-Continent Refiners Seek Lower Rates to Northeast

By GRADY TRIPLETT

Tulsa, Okla.—Through lower freight rates, Mid-Continent refiners are seeking to enlarge their marketing territory to include the Northeastern States. Testimony, seeking to show how the present rate structure is restricting Mid-Continent refinery outlet was presented at the Tulsa hearing of the Interstate Commerce Commission the week of November 15.

The case is the investigation of the commission into rates on petroleum products east of the Mississippi river. Further hearings will be held at Atlanta November 17, Pittsburgh November 29 and the last will be in New York, December 6. Previous hearings were given at St. Louis and New Orleans.

The territory into which the Mid-Continent refiners seek outlet, through lower one-figure rates, is east of the Indiana-Illinois state line and north of the Ohio and Potomac rivers.

The case of Mid-Continent refiners was presented by W. S. Lynch, traffic expert of the Mid-Continent Refiners Traffic Association. The data was prepared by him and J. F. Lawrence, commerce counsel of the organization.

Groups Suggested

This testimony was to the effect that the territory, described as the Northeastern States, consumes 42.8 per cent of all gasoline produced in the United States while producing but 3.7 per cent of the total gasoline. The contention from this was that present freight rates into this territory prevent Mid-Continent gasoline from moving there, thus allowing crude oil to be moved by pipe lines either into the Northeastern States or near that district for refining. The plea further was that this condition had hampered the growth of the refining industry in the Mid-Continent area.

To remedy this condition, Mid-Continent refiners suggested a division of territory east of the Mississippi into eight groups, each to have a one-figure freight rate on petroleum products. While some of these groups are west of the Indiana-Ohio state line, they present a scheme of progressively higher rates, at schedules lower than those now prevailing and the hope of the Mid-Continent refiners is that their adoption will allow shipment of Mid-Continent gasoline into an area now denied them on account of excessive tariffs.

Rates Progressive

The western part of Indiana is designated as the first group to have a rate of 33 cents, which is the rate now prevailing from groups 3 to Peoria, Illinois. This group is an extension of the present Southern Illinois group.

The second group is an extension of the present Chicago group with a rate of 36 cents. In includes Kokomo and Indianapolis.

A rate of 38½ cents is suggested for the third group, which includes part of Indiana, a small part of Michigan and the western part of Ohio.

The fourth group, with a suggested rate of 41 cents, takes a part of Michigan, the middle section of Ohio and the western part of West Virginia.

In the fifth group, with a rate of 43 cents, are parts of Michigan, the east corner of Ohio, west half of Pennsylvania, the southwest corner of New York and the middle part of West Virginia.

The sixth group, suggested rate being 54 cents, includes the middle part of New York, the eastern half of Pennsylvania, the western part of New Jersey, the western part of West Virginia, all of Maryland and Delaware.

In the seventh suggested group, rate 47 cents, comes the eastern part of New York, eastern part of New Jersey, Vermont, Massachusetts, Connecticut, Rhode Island and part of New Hampshire.

The eighth group, rate 49 cents, includes part of New Hampshire and all of Maine.

These suggested groups grow wider as they are removed from the western edge of their boundary, while rates grow higher.

In asking the new groupings and lower rates, Mid-Continent refiners claim they are seeking a level of rates similar to those now allowed into Middle Western States . It is the first chance the Interstate Commerce Commission has ever had to fix petroleum rates into the northeastern territory from the Mid-Continent.

Mid-Continent Losing

The present series of hearing has no relation to the recent decision of increased differential between Kansas and Oklahoma. Kansas, Oklahoma and North Texas refiners are in accord in the present effort to gain the lower rates to the Northeastern States.

In proof of his contention that the Mid-Continent is refining less and less of the crude oil it produces, Mr. Lynch gave government figures. In 1919, 86 per cent of the crude oil of the Mid-Continent was run in Mid-Continent plants. In 1925, 57 per cent of Mid-Continent crude oil was run through plants of that territory.

In other centers of crude oil production the other groups have consumed through refineries more than the crude oil produced in each. For the northeastern states, refinery consumption of crude oil in 1919 was 476 per cent of the crude oil produced adjacent to the territory. In 1925, this area consumed in its refining plants, 1035 per cent of its production.

Further figures were introduced to show that in 1925, 25 per cent of the refining capacity of the Mid-Continent was shut down. Only 2.02 per cent of the refining capacity of the northeastern area was shut down in 1925.

Rail Tonnage Lower

It was further pointed out that the railroads have been losing tonnage of petroleum steadily since 1919. Instead of crude oil and refined products being carried by rail, transportation is had by pipe lines.

The hearing in Tulsa was before Examiner John B. Keeler, representing the Interstate Commerce Commission. Aside from data presented in behalf of Mid-Continent refiners collectively, the Transcontinental Oil Company put in evidence seeking lower rates to Southeastern States. The American Refining Company offered evidence in support of a plea for lower rates into North and South Carolina.

Wade Hydrogenating Plant In Operation

Catalytic action on vapor credited with high yield of motor fuel of anti-knock qualities

By GEORGE REID
Staff Representative

CATALYSIS is one of the most curious and interesting phenomin chemistry, for the reason that reactions are initiated and the velocity of chemical reactions are affected by a substance, catalyser, which introduces no energy, nor undergoes change during its presence in the region of chemical activity which it seemingly has induced.

The application of the theory and principles of catalysis are frequently manifest in the petroleum industry especially in the pyrolytic phase of developments, and there are several processes or systems which employ catalysers of different types and composition in their operation. Usually these catalytic agents have been inserted in the system to act upon the oil or rather to hasten the reaction of the oil particles in their molecular disassociation and recombination. The process under discussion at this writing however, secures, it is said, the influence of the catalyser upon the oil vapors, and in addition hastens or aids the disassociation of aqueous vapors (steam) while at high temperature,—and in so doing the free hydrogen combines with liberated carbon from the oil vapors, and the oxygen appears in combination as fatty acids—thus forming through the disassociation of steam and oil vapors and the recombination of both a product rich in aromatic hydrocarbons and others of high value as motor fuel components.

Many Patents

The Wade Hydrogenating Process in operation at Signal Hill, Calif., was perftcted by H. C. Wade after about 17 years of experimental work in the production of aromatic hydrocarbon materials, and in the production of toluene and other bases for high explosives during the world war. The United States letters patent held by Wade indicate that the basic patent for his system was given in 1910 and during the next 15 years patent after patent follows until the total number of letters patent covering the process of hydrogenating petroleum oils throughout every country in the world totals 391 patent grants.

Though the Wade process is usually constructed of its own pecuiar type of equipment consisting of kiln, dephlegmators and condensers, it is obviously unnecessary to construct any other equipment than the kiln or retort when installing this system on skimming plant yards, for other than the highly specialized kiln, any efficient distillation apparatus is applicable.

The kiln is described as 16 to 20 feet in height, and about 6 feet in diameter, circular, and fired through a large dutch oven. Figure 1 illustrates a 4-coil kiln in operation, and figure 2 illustrates some of the mechanical details of a 7-coil kiln under construction. Note how the multiple coil, which consists of 7 1½-inch diameter coils of 120 feet length, using Shelby seamless tubing; is nested so that each coil is in practically the same zone of highest temperature in the kiln or furnace. Each of the 7 coils is independent and operates independent of all others. Above this nested set of coils there is placed another coil for preheating water by utilization of the flue gases—this coil being 1½-inches diameter and 80 feet in length.

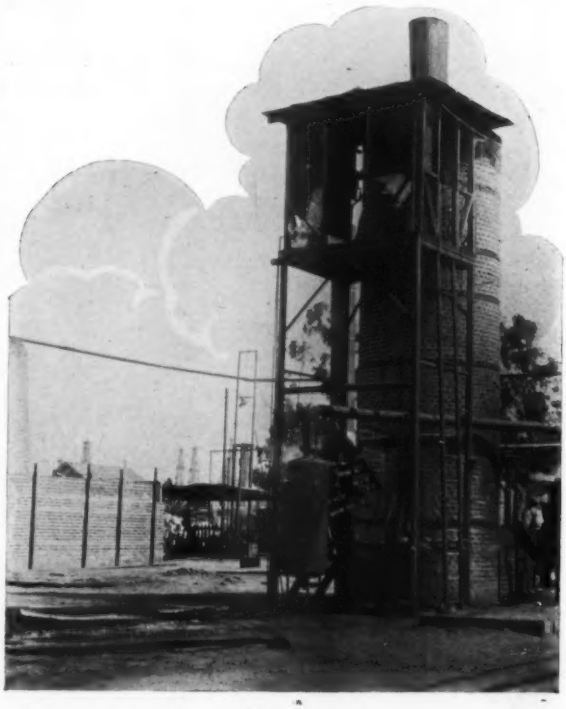


Figure 1
The Liln or retort in the Wade Hydrogenating process of the Hydrolene Company at Signal Hill

Operating Method

Charging stock for the process consists of either fuel oil or topped heavy distillates recovered at the skimming plant below gasoline, such material being usually termed gas oil. In operation the gas oil or charging stock is preheated by interchange with some hot medium in the usual manner to a temperature of about 250 deg. Fahrenheit and then conducted to the top of the kiln, where the stream of preheated crude is divided by manifold or header into the number of streams corresponding to the number of coils in the kiln. From the header the split streams are conducted to an injector of special type and of company design.

Water is preheated in the kiln as described above to a temperature of about 350 deg. F. and held at this temperature in the coil under pressure. This very hot water under pressure is also conducted to the top of the kiln and handled similarly to the preheated crude oil.

The superheated water is fed into the nozzle, injector, or atomizer, simultaneously with the prehated oil charging stock. The inventor describes the results of this injection at the entrance of the first convolution of the coil by stating that the preheated water is thus released into the generating coil by sudden explosive action into steam and the comingled oil and water being subjected to this explosive action of water so suddenly converted into steam has the effect of breaking up the hydrocarbon bodies into exceedingly fine particles thoroughly associated with the aqueous vapor molecules, and as the lighter constituents of the oil are broken up they are immediately "absorbed" by the aqueous vapor; being thus pre-

vented from depositing free carbon when kiln heat or temperature and catalytic action causes the disassociation of the hydrocarbon molecule.

After the injection of oil and water and the subsequent atomization of both, the mixture is then conducted through the 120 feet of coil and subjected to a high degree of kiln heat (from 1200 to 1400 degrees F,) the contents of the coil being heated to around 1250 deg. F. until the last convolution of the coil is reached. This procedure results in the formation of gas or vapors entirely, and while both water and oil are charged to the coil, nothing but vapors are removed.

Catalytic Agent Secret

At the last convolution of the coil the aqueous vapors carrying the oil vapors are introduced to a catalytic agent where, it is said, the aqueous vapors are in a large measure disassociated into hydrogen and oxygen and the oil vapors into hydrogen and carbon. The catalyser is of nickel chrome alloy (the materials constituting the alloy being held secret) formed in attenuated mesh, or coiled fine wire, and presenting a very large surface in proportion to its mass, and often little resistance to the flow of vapors through the catalytic chamber. The catalyzer is illustrated in Figure 3. The catalyzer is said not only to disassociate the constituents of the steam, but it effects new combinations between the thus free hydrogen and carbon and hydrogen atoms of the oil treated, thus forming when later condensed a condensol which is the source of a new and stable motor fuel. One of the interesting peculiarities of the process is the almost instantaneous reduction of temperature of the kiln generated vapors upon passing through the catalytic chamber. The vapors in the coil are heated to the temperature previously mentioned, while the vapor leaving the catalytic chamber is remarkably reduced in temperature. Opening a quick-opening-valve at this point of the system releases the vapors, and they are so cool that they do not burn the naked hand. The capacity of the 7 coil unit is 420 bbls. daily, and of the 4 coil unit 240 bbls. daily.

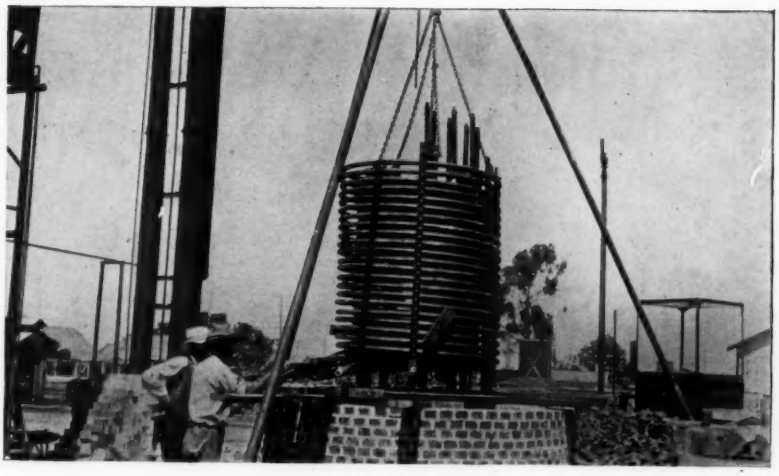


Figure 2
One of the seven coils being nested in the kiln wall, under construction. Each coil is 120 feet long.

The volume of oil of condensol recovered from the kiln is invariably slightly greater than the volume of oil charged to it. The volume of water recovered after processing is greatly less—and fatty acid materials recovered from the system in small quantities have been successfully employed experimentally in the preparation of soaps and disinfectants with other probable uses indicated. The quantity recovered however is not great.

One Operation

The flow chart of a Wade plant calls for the installation of the kiln, where the oil is treated with water as described then the vapors formed are conducted to a series of deplegmators where they are fractionated and the motor fuel content removed, condensed, and piped to storage. This method gives the finished product in one operation.

Figure 3
The catalyzer is of nickel chrome alloy and so designed that it can be quickly removed or replaced without hindering the plant operation.

Reports at hand perpared by various engineers indicate that various oils treated by this process have yielded motor fuel in recoveries or yields ranging from 50 to 80% of the stock charged, the remainder of the charging stock, or residuum, having been employed as fuel under the kiln and for boiler firing. In view of the simplicity of the construction and the low expense of building, and taking consideration of the low overhead or operating costs, these yields make appear unusually high when compared to the investment required—say $10,000 per 500 bbl. unit. The construction of the unit entails only the purchase of standard materials with the exception of the catalyzer, which the company guarantees to furnish at a cost of only $25.00 each. The plant is controlled by either thermostatic or other standard temperature control devices.

It is present practice to redistill the condensol produced by the kiln treatment of the charging stock, removing that portion of the condensol which upon A. S. T. M. distillation testing methods boils in the U. S. Motors gasoline range. This is accomplished by steam or fire distillation in conjunction with the usual type of efficient fractionating column. The motor fuel recovered is low in gravity; usually around 50 deg. A. P. I. but governed naturally by the nature of the stock charged to the plant. The initial boiling point and end points are maintained in accordance to customers preference, though usually 100 deg. F. and 435 deg. F. respectively.

The color of the finished motor fuel is a pale lemon, and as the coloration does not seem to hinder the sale of the material, very few attempts have been made to bleach it. Color, however, is at this time of little consequence. The odor of the fuel is unlike that of most gasoline but not offensive. Being of high aromatic and olifin content the fuel has a definite value as an anti-knock product of greater mileage possibilities.

Elimination of Waste in Refining Petroleum

By CHARLES G. REBMAN
Mid-Continent Petroleum Corporation

WHEN crude oil was first refined it was heated in small kettles made of cast iron ore or steel and a condenser coil was placed in a wooden tank. As the demand for crude oil products increased these stills became larger until finally the old cheese box type of still was developed. Consumption still growing and with an idea of fuel economy the horizontal cyclindrical still was developed.

This brings us down to the beginning of the twentieth century. About this time the refiners recognized that these single or batch stills were very inefficient. The process that they went through in operating these stills was, first to fill the cold still about two-thirds full and start the fire. As the oil elevated on temperature the first over was light gasoline. After taking over kerosene, etc., their reduced the batch to a desired point and pumped out the still. The overhead products were run into the various rundown tanks as the still came up on temperature. Then the still was allowed to cool, opened and inspected and a fresh charge was pumped in and process repeated. Being an intermittent process it was wasteful of fuel.

Continuous Running

This lead to the adoption of running the continuous system. Several stills were connected in the series and the oil was pumped through without interruption. Each succeeding still was kept at a higher temperature, predetermined for a certain product overhead. From the last still the bottoms were continually withdrawn. Large increases were effected thereby in efficiency. The fuel efficiency of a batch still usually runs between 15 to 20 per cent. It cannot be improved to a great extent, because in the first place the flue gas temperature must be from 200 to 300 degrees above the oil temperature. As the still near the end of its run and the heavy ends are being heated, the flue gas temperatures are from 800 to 1000 degrees. From the nature of the liquid distilled, very high combustion temperatures were not desirable and therefore excess air is used. With this type of still no heat exchange can be used.

Even now we must use the batch still when running lubricating oils. The product in the stills to meet certain test specifications must be batched down. This still is also in use for reducing a neutral stripping naptha or gasoline from brite stock and similar uses. The only way to increase the efficiency is to watch the construction and insulation. By prevention of air leaks through the brick setting, proper insulation over the still and plenty of combustion space, the losses can be brought to an irreducable minimum. Recently many batch stills have been built to resemble the horizontal tubular boiler. Some of the old stills have been revamped by installing many 6-inch tubes lengthwise of the still. This allows the flue gases to make another pass and thereby gives better fuel economy. These stills, however, do not allow the oil to be reduced further than the uppermost tube. They also are not as easy to clean.

Fuel Economy

Some of the batch stills have been used to operate semi-continuously. That is as the oil is reduced in the still a fresh charge is pumped in. A point is reached when some of the bottoms must be withdrawn and in some instances this is done continuously. By the introduction of a heat exchaner to exchange the heat from the vapor leaving the still to the incoming oil, the overall efficiency can be brought up considerably.

In a battery of continuous still many arrangements can be made for increasing fuel economy. As the crude oil is fed to this still continuously it can be made to absorb heat from three sources. If an exchanger is installed it can absorb some heat from the residuum leaving the last still. A heat exchanger can absorb the heat from the vapors that leave the stills. By means of economizer it can be made to pick up heat from the flue gases.

If the residuum is run for fuel oil or bottoms that can be pumped continuously from the last still, a nice heat saving can be effected. However, there are installations of 9, 10 and 11 stills in the system where the last three stills are used to batch down the oil from the continuous system. In this case the residuum is an intimate proposition and does not lend itself to heat recovery.

Heat Exchangers

With installation of heat exchangers on the vapor lines enough heat can be recovered to allow the crude oil to enter the first still at a relatively high temperature. There are many installations where this temperature reaches 300 to 350 degrees and above. With certain types of crude this will enable an initial topping. Where this is done the first still in the system usually as a vapor separator.

Economizers similar to those used in power plant practise are used to recover the heat from the flue gases and exchange with crude. The heat from the flue gases may also be utilized in heating steam by means of an economizer. Many installations have demonstrated the wisdom of reheating of steam in the refinery. In most refineries the power plants are centralized and long steam lines are necessary to distribute the steam to all parts of the refinery. Water will become entrained with the steam even in cases where it is initially superheated in the boiler houses no matter how well the lines are covered. This also means that the steam will be in lower temperature when it reaches the stills. Water in the steam defeats the purpose for which it is intended. The water upon entering the still with the steam has to be evaporated into steam, then superheated to the temperature of the oil in the still, all of which means consumption of more fuel to heat the oil. By means of the waste heat superheater this can be eliminated and improve the efficiency of the battery. Waste heat economizers can also be used to heat boiler feed water. Air preheaters can also be installed to heat the air for combustion. It should be noted that economizers will not raise the still battery of efficiency, but that the resulting saving will appear in the overall plant efficiency. Oil or air preheaters will effect the efficiency of the battery itself. Waste heat boilers have been used in some installations, especially on coke stills where the flue gases temperature runs quite high.

Shell Still Advantage

The continuous battery of shell stills have a distinct advantage when it comes to cuts. Each still should give a steam of constant quality and quantity, thereby simplifying tower design for fractionation. There are many types of towers used among which are the baffle, the packed and bubbler towers. The latter two are the best from a standpoint of contact between the evaporated liquid and the vapors. What is desired in the equal distribution of the descending liquid and the ascending vapors. Because of the tendency to channel in a packed tower makes the bubble tower the best available today. By the proper proportioning and designing of the tower it

*Read before Mid-Continent section of the American Society of Mechanical Engineers at Tulsa, October 29, 1926.

is possible to get complete separation of all products up to the heavy ends The one big advantage of a tower is that cuts can be made at each of the two adjoining stills and run both into a single rundown tank to make a certain specified product. From a fuel standpoint this means the least amount of rerunning. In many refining pressure distillate, filter wash and other products have been distilled by simple pumping over the top of certain towers.

Pipe Stills

The idea of using a series of pipes or tubes in a furnace setting has been known for a number of years, in fact a few have been in service. They have been used for topping of crude oil and preheating oil for various purposes. It is only in the last few years that they have been developed for large capacities, greater efficiency and better products. In the still large quantities of steam must be used for agitation to prevent local overheating of the oil. In a pipe still by forcing a comparatively small steam through a continuous coil with a pump we unquestionably have the best method of obtaining good circulation. The oil must be circulated at a very high rate to get turbulent flow instead of a steam line flow. Turbulent flow insures through mixture of the oil and allows the oil to come in contact with the heating surface only momentarily. One advantage of a pipe still from a thermodynamic standpoint is that the counter flow principle of heat transfer can be employed. By a proper design of tube bank and furnace the oil can be heated to temperatures so that when it leaves the tube bank and enters the separating drum or tower up to 85 or 90 per cent of it is evaporated and this without injury to most lubricating stocks. This type of furnace allows the carrying of high CO_2 in the flue gas, further increasing fuel economy.

The vapor and oil can be discharged to the bottom of a bubble plate tower. These towers are now operated to give five or more separate distillate streams of desired specifications as initial end point, viscosity or flash. With Mid-Continent crude 6 to 8 per cent bottoms is accomplished in a single tower. A heat exchanger is applied to each out or stream. Fuel efficiencies from this unit run around 65 to 70 per cent and in some cases much higher. By the installation of air preheaters this unit can be made to approximate very good power plant practise.

Cracking Stills

The demand for gasoline has increased during the past ten years and there has been apprehension as to where the gasoline would come from. From the amount of crude that was produced and the existing method of extracting gasoline therefrom, it looked as if there would be a shortage. The refiner has developed cracking processes which increased the yield of gasoline from crude, saving the situation. This is the outstanding development in the petroleum industry. Because of its social and economical importance it is one of the great industrial advances. Gasoline of superior quality has been made available at prices well within the reach of all. Hundreds of millions of dollars have been invested in cracking equipment and it is very odd that very little scientific work has been done. We do not even now know the ways and wherefores of many things that happen in cracking. It seems to have all done empirically and yet each step forward has been done on sound reasoning.

In some cracking processes the pressure runs to 1200 pounds, with temperature of 1000 degrees and more. When one considers the corrosive actions that take place it is hard to conceive of materials and equipment standing or under this severe service. Formerly the oils were cracked in a cylinderical vessel directly fired. Some processes had cylindrical vessels with a few large pipes in the furnace resembling a water tube boiler. With this sort of arrangement temperature very rarely exceeded 800 degrees with pressures up to 150 pounds. These stills require expert attendance, because as the oils are cracked carbon is formed and is apt to settle on the heating space, thereby causing hot spots.

The present development in the art of cracking is the use of a tube bank for heating. The oil is circulated through the tube at a very high rate to prevent deposits of coke. The furnace is so designed that a furnace temperature is not excessive. This is done in several ways. One is the use of excess air. Another is the recycling of flue gases.

Flue Gases

In the recycling of the flue gases approximately three-fourths of the flue gas is recirculated or returned to the furnace chamber. These gases are introduced in such a manner as to thoroughly mix with the gases from the fuel burned without interfering with complete combustion. Excess air is replaced and being of considerable higher temperature than that of the air required much less fuel is used to obtain the furnace temperatures desired. An air preheater also recovers the heat from the flue gas. The pre-heated air is delivered to the furnace chamber for the combustion of fuel. The third method for reduction of furnace temperature is to design the tubes so that part of them are subjected to radiation heat only and the remaining tubes subjected to convention heat. By this method high CO_2 can be used and the main tube bank temperature kept within 1300 to 1500 F. An air preheater can be used in conjunction with this bank so that exit flue gases will be around 500 degrees and under. With oil temperatures running from 850 to 1000 degrees it speaks well for the engineer.

Evaporation of Light Hydrocarbons

Large losses in a refinery have been due to the evaporation of lighter products in storage. The loss due to uncondensed vapor issuing from the receiving house should not exceed one per cent. In actual practice many refiners suffer a loss of from one to ten per cent and much of this is assumed to be due to uncondensable gas. The uncondensable gas loss amounts to as much as two per cent in the case of light crudes and with inadequate condensers. Loss due to evaporation in rundown and storage tanks accounts for the greater part. The loss from rundown tanks of cracking plants in hot weather has frequently been as much as ten per cent and as low as three per cent in cold weather. There are several ways that have been tried for preventing or minimizing losses of gasoline in tanks.

If tanks are painted with an aluminum, white or light colored paint the rate of heat absorption by the liquid is cut down materially. The rate of heat obsorption is approximately as follows: Aluminum paint, 20.5;; white paint, 22.5; black paint, 54. In some tests that the writer is acquainted with it was found that in a gasoline container painted with black paint the vapor space during the coolest part of the day had a minimum temperature higher than the highest temperature reached during the day by the aluminum and white paint. This is conclusive evidence that paints play a large part in reducing the vaporation losses. Most refiners have standardized on light colors for the painting of storage tanks. Another method of reducing evaporation losses in rundown and storage tanks is the use of a gas collecting system. Tanks are fitted with steel tops and the seams are electric welded.

Gas tight appliances such as stuffing boxes for swing pipe, cable and gas tight gauging hatch are used. From the roof a connection is made with a suitable sized pipe or pipes which leads to the main headers and then to the gas compressions or absorption plant. At each tank there are installed pressure and vacuum relief valves. Supersensitive valves are also used to get a small pressure in the tank. The volatile gases are drawn to the plant by exhausters. The compression process employs pressure varying from 50 to 300 pounds per square inch. The compressed gas is cooled by passing it through water cooled pipes. Cooling the gas under pressure results in condensation of a portion of the recoverable hydro-carbons. The absorption process consists of absorbing the recoverable gasoline by means of solid absorbent such as charcoal or by a liquid. The absorbent is heated or distilled for the recovery of gasoline. Then the denuded absorbent is cooled and used over again. The absorption process gives greater yields than the compression process, but if light compression pressures are carried and refrigeration is used the results will be about equal. When large volumes are available the absorption plant is preferable because the installation cost and the operating expense is less.

In some refineries the recovered gasoline is blended with naphtha to desired gasoline specifications and shipped.

The covering of the surface of the liquid in a tank with a foam that would

stand up for a comparatively long time has been tried. This foam had the tendency to slightly increase the pressure on the surface and to prevent the wind drift through the roof. This method is not used extensively.

Pressure Tanks

Some refiners have adopted the plain steel roof with close rivets, seams caulked or welded and in addition equipped with gas tight appliances. Vacuum aid pressure valves with breather lines are installed but only a pressure up to the maximum of one inch of water is carried. The tank is painted a light color. This has led to carrying a greater pressure in the tank. Tank roofs have been built to withstand a vapor of one pound. It is claimed that the evaporation loss has been reduced to 0.21 per cent, also by the elimination of evaporation the reblending of an approved type has been used to cover tank roofs and around the eves. The argument for this is that it prevents the heat transfer from the sun rays to the gasoline. It has proven to do this very effectively and too cut down the evaporation loss.

Engineers have attacked the problem from still another angle. Steel roof tanks must be provided with vents or breathing pipes to accomodate the natural expansion and contraction of the liquid and especially the gaseous contents under varying temperatures. This supplies more to "working" tanks into which and from which gasoline is constantly being deposited and withdrawn. Without vents the tanks would be wrecked by suction and excessive pressure. As the temperature rises during the day several thousand cubic feet of air saturated with valuable gasoline vapors are poured forth into the atmosphere. As the temperature falls at evening and during the night fresh air is sucked in to become charged with gas and expelled again when the temperature goes up. This suggested the balloon or "breather bag." As the temperature increases the heretofore lost vapors are exhaled into the breather bag and as the temperature cools down sucked back again into the tank. This bag is made from a patented gelatine glycerine mixture impregnating the closely woven cotton fabric and is impervious to gasoline or gasoline vapors.

A steel floating roof has been developed and now in use. This type of roof has gas tight seal and the vapors are trapped there by the shoe which projects below the bottom of the pan. The vapors cannot pass immediately into free air but must travel circumferentially inside the gas tight section for a considerable distance until they reach a mercury sealed vent. Vapors then escape through this vent of the surface is always covered and under a slight pressure and the roof follows the level of liquid at all times except when it is very close to the bottom.

Loading Losses

Low pitch tank roofs have also been used to cut down vapor space and hence the loss. It is not much advantage when the tank is worked constantly. Many refiners have water sprayed the gasoline tank.

The average evaporation loss in filling tank cars with gasoline are high because most of the gasoline is shipped during the hottest period of the year. To reduce evaporation, some refiners load the most volatile products at night, or spray with water if loading during the day. Both of these methods reduce evaporation losses, but if it is not practical to do all the loading at night and it is doubtful whether a water spray is always economical.

Many factors affect the rate of evaporation during the loading of cars. Besides the character of the gasoline and the atmospheric conditions one must consider the temperature, also the rate and method of filling the cars. Formerly it was the practice to have the loading line extend only a few inches into the dome and allow the gasoline to splash into the car. This is very wasteful practice, for it allows the air in the car to become rapidly saturated with gasoline vapor and permits air currents to carry away the unsaturated air and entrained liquid.

Most refiners now use a sleeve which is attached to the loading line and extends from the dome to the bottom of the car. This reduced the loading loss considerably as splashing is eliminated and air currents do not make such intimate contact with the gasoline. However it is doubtful if this practise alone reduces the evaporation losses to the economic limit.

Installations have been made of a continuous line to the bottom of the tank car and the end of the line has a flexible hose. A later development is the use of a special dome cover which screws into the dome and the car is loaded under a slight pressure.

Acid Recovery

One of the most vexing problems in a refinery is the disposal or recovery of spent acid left from the treatment of petroleum products. Several methods are employed in the disposition of the weak acid. It may be neutralized by washing with alkali water, in order not to polute or contaminate the streams, or it may be sold to other industries for fertilizer or for restoration. The high cost of transportation together with the wear and tear on requirement has led many of the larger refineries to install recovery plants. It is doubtful whether the methods used in the past produced results that justified the investment and operating cost.

The sludge acid from lubricating stocks and light oil products is recovered by separation and concentration. The general practise was to heat the weak acid in several lead lined pans erected over furnaces. The water is driven off until the acid reaches 60 degrees Be. Stronger acid has a corrosive effect on the lead. In early days glass bottles were used to concentrate to 66 degrees Be. and they were embedded in sand with furnace beneath. Each container was filled, evaporated and separated, creating an excessive amount of supervision as well as being very inefficient. Next platinum stills were brought into practise but soon abandoned in favor of cast iron stills. Two or more of these strong acid stills are used in series, the acid flowing from the last to storage. This pan system of concentrating has become obsolete because the fuel efficiency of the whole arrangement was low, labor costs were high and maintenance costs were excessive.

Towers Used

The advent of the Glover tower gave chemical engineers the idea of using the principle of this tower for the higher concentration of acid. Today the tower system and the combined tower and surface evaporation systems of concentration are the methods in most general use. The basic principle involved in the combined tower and surface evaporation systems is the blowing of hot air through the batch of acid to be restored. In accordance with the physical law of practical pressures, the boiling temperature of acid of a given gravity is reduced when air is introduced directly therein.

Wiht this process a heavy lead pan is used and is lined with acid proof masonry about 30 feet high. This is loosely packed with brick. The weak acid enters the top of the tower and comes in contact with the rising vapors, absorbs heat and falls into the pan. Hot air is blown through the acid in the pan. The hot air is supplied by a blower discharging through a combustion chamber at a pressure sufficient to discharge through the bath.

Two adjoining towers are needed, the first stage to concentrate from 30 degrees Be. to 57 or 60 degrees Be. The air temperature generally used are between 1100 and 1200 dgrees F. The gases leave the first stage with so little acid that it can be discharged into the atmosphere. By the installation of a Cottrell electrical precipitator the acid is removed from the vapors of the second stage. The advantages of this system are, it occupies a small space, efficiency is good, labor requirements reduced and the per cent recovery is 90 to 95.

There is still another method known as Simonson-Mantius vacuum process. Due to the vacuum this concentrator works under a much lower temperature and is able to obtain 65 degrees Be. acid by the use of steam at 150 pounds as the heating medium. The 66 degree Be. acid may be obtained by adding a small quantity of fuming sulphuric acid. This system has an added advantage over the previous concentrator as the water used in the barometric type condensor is also used in absorbing the fumes.

Corrosion

Corrosion in the refinery creates a twofold loss, first by damage to equipment and second by wastage of materials from a limited resource. Corrosion cost the refining industry millions of dollars a year and much progress has been made to eliminate the excessive expenditure.

To enumerate only a part of the corrosion problems, we have underground lines, condenser coils and boxes by water and hot vapors, cracking stills, shells and

(Continued on page 62.)

Getting Finished Cuts From Single Tower

Millif brothers have perfected equipment to give eight streams at one heating

By GEORGE REID
Staff Representative

DURING the last three or four years the more progressive refinery engineers have made progress toward the perfection of highly efficient fractionation equipment. The bubble type tower was borrowed from the alcohol industry and in its application to petroleum fractionation problems it has become extensively employed. The bubble device has been incorporated in numerous mechanical arrangements, most of which are now common knowledge. The application, however, of this type of fractionating equipment to the single tower for the fractionation and separation of all of the fractions desired, in one heating, has been, and is, the goal of many experimenters, and the perfection of such equipment has been obtained by a very few.

Within the writer's knowledge there are several towers employed in the separation of three distinct streams, or fractions. Almost any tower can be made to produce two streams, overhead and bottom. But it is beileved that Frank A. Millif, and his brother, John A. Millif, have perfected and patented, perhaps the only multiple-compartment, fractionating device which will deliver as many as eight fiinshed cuts, continuously, with desired uniformity of quality of product, and with surprisingly low cost of installation and operation.

There are now three of the Millif type multiple stream multiple compartment towers in service at two refineries on the West Coast. Two towers designed for the fractionating of 3000 barrels daily are operating at the Hart-Derring refinery at Fellows, California, and one tower installed more than a year ago is in operation at the Marine Refining Corporation's Vernon, California plant. This latter tower was designed for 5000 barrels daily throughput and will be discussed at this writing.

Design

The Millif brothers have for years been intensely interested in refinery design, and an inspection of the Marine refinery gives evidence of the practical application of several of their interesting and unusual self-designed devices, the perfection of which has been conducive to higher efficiency and better economy in the distillation, fractionation and condensation of crude oils. One of the most interesting features of plant operation is presented in the arrangement of header, interchanger type, coils employed to cool the streams derived from the various compartments of the tower by conducting them in countercurrent flow to the cool crude oil. A cooling of

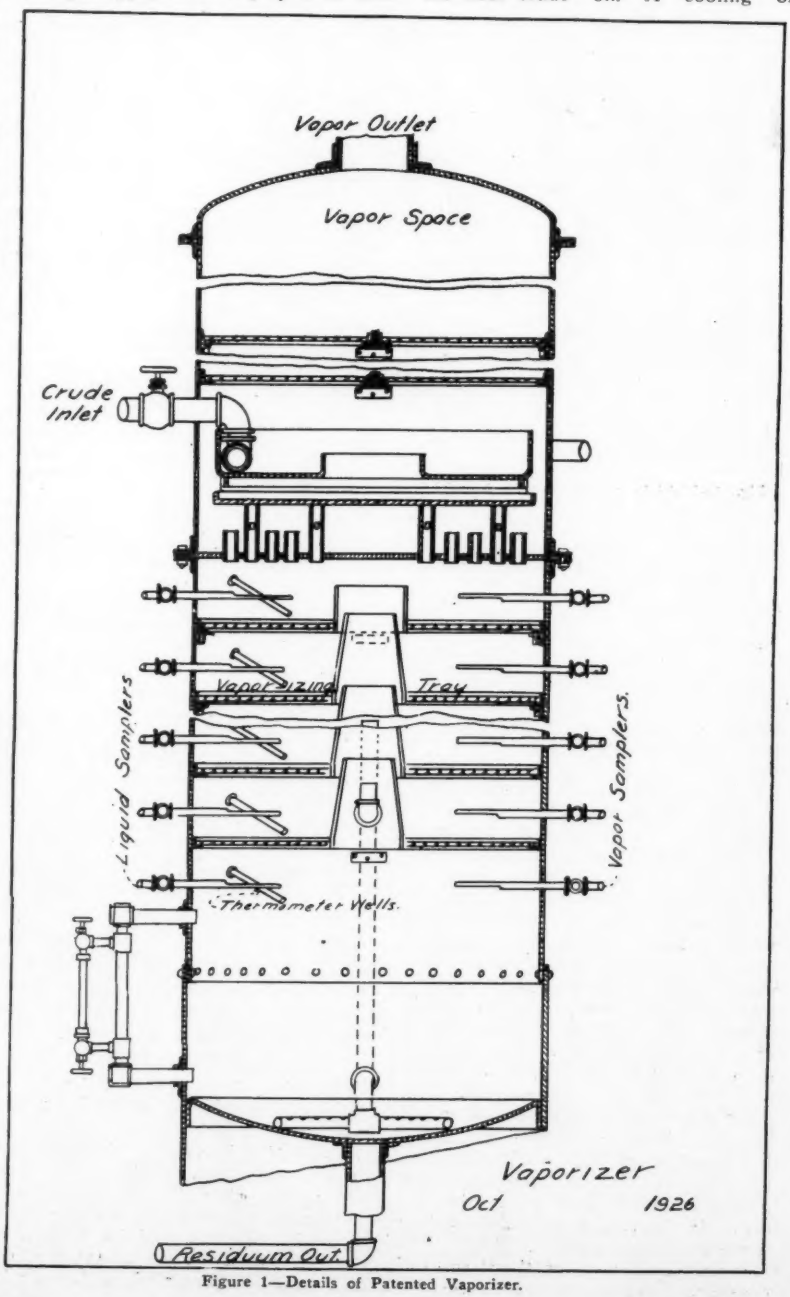


Figure 1—Details of Patented Vaporizer.

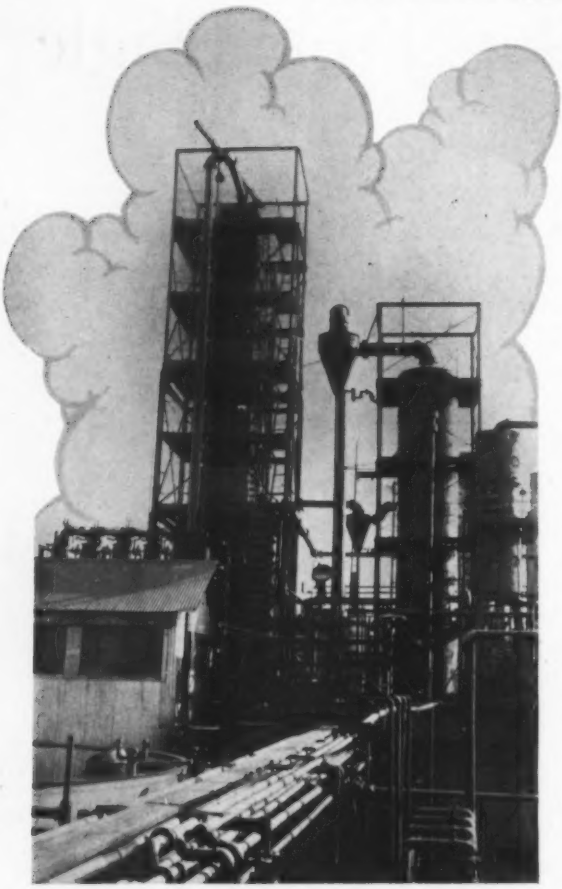


Fig. 2—Multiple compartment and multiple stream fractionating installation at the Marine Oil Corporation's Vernon refinery.

condensates by crude oil charging stock is accomplished as follows:

A Fairbanks-Morse pump 10"x6"x12", is used to charge the cool crude to the "aftercoolers," or what might be termed the preheaters. The crude leaving the pump is conducted through a four-inch discharge line to enter a header where it is distributed to several 2 inch lines. These two-inch lines are incased in three inch pipes, which arrangement constitutes the construction of the preheater or aftercooler system. The construction is similar to the usual heat interchanger when constructed of pipe on the counter-current flow principles. The fresh crude, which is in this case a cooling medium, flows through the ncased 2-inch lines counter current to the condensates derived from the compartments of the multiple stream bubble tower. The aftercoolers function to cool four streams of finished product derived from the bottom of the tower and from the six compartments. This installation eliminates the water cooled condenser box for similar work, or the condenser of any type, and in addition to saving the cost of such equipment, also is conducive to a remarkable decrease in the volume of water required for refinery operations.

From the aftercoolers, the streams of condensate are conducted to the receiving house at temperatures ranging from 90 to 115 degrees F., which is sufficiently low in temperature, for these streams are all below the light gasoline cut and have relatively high initial boiling points.

The crude, after passing through the pre-heater or after cooling system, enters a second header to form one stream the temperature having been increased to around 40 deg. F. Thus the cold crude oil is performing much of the cooling work usually done by water and condensing boxes, and at the same time the crude itself becomes preheated to a temperature almost equivalent to that usually occurring in inter-changer installations proper.

Flow System

The partially heated crude next enters two Southwestern type heat exchangers which utilize the hot fuel oil residuum from the vaporizer, or separator, at the heating medium. The first exchanger is termed a "single" and at this point the crude oil temperature is increased to about 260 degrees F. The second, or "double" exchanger raises the temperature of the crude to 300 degrees F. Upon leaving the exchangers the crude is expanded into a drum like container, which might be termed for lack of better name, a primary vaporizer. From this expansion chamber a stream of 61 gravity gasoline of 350 end point is derived—the volume of which is governed by the distillation range of the crude being distilled or treated.

The vapors derived from this preliminary heating are condensed in a Southwestern type condenser, without fractionation, and delivered to receiving house and run down. This primary separator also acts as a settling tank wherein all foreign matters occurring in the crude is dropped. The temperature of the oil in this primary vaporizor is sufficient to remove all water occuring in the oil, and this arrangement of preheating and partial removal of light vapors, with the concurrent distillation of the water content of the oil makes it possible for the plant to operate almost any type of crude, regardless of its b. s. and water content. The advantages of such conditions are obvious, for in addition to ease of operation, there is inevitably a certain proportion of oil emulsions which are yielded as good oil when the emulsion is broken down.

The separation of vapors in the primary vaporizor naturally has a cooling effect on the oil and the crude conducted from this point to the retort is usually about 280 degrees. The retort was also designed by the same men, and consists of 96 joints of 4-inch tubing. Space does not permit of its detailed description here. Sufficient heat is applied here to vaporize the crude being treated to remove all of the gasoline, kerosene and stove oil as vapors.

Vaporizor

The heated oil is conducted to the vaporizor or separator to enter near the top of the device, flowing to the bottom from where the residuum is conducted to the exchangers and storage. The vaporizor was also designed by the same men, and is a departure from the usual type of apparatus employed for such separation. Figure 1 shows the details of construction of the vaporizer. The device as installed at the Marine plant is 6 feet by 18 feet and designed for 5000 barrels of crude daily.

As the hot crude enters the top section it is given a tangental flow, spreading over a wide surface, to overflow over the rim of the cup in the center. The greater portion of the vapors are removed in the first or top tray. The oil dropping from the top tray is spread by means of the plate as shown, and falls to the second pan, where a liquid level is controlled by means of the rising nipples, which in this case act as weirs. The oil overflows through the weirs, or nipples, to the third tray and the 12 trays below it are constructed of screen, through which the oil must pass. The vapor passes upward thruogh the louvre-like devices in the center of each of the lower trays, or sections. Each section is provided with vapor sampler outlets, and liquid sampler outlets, as shown in the cut, and also with thermo-couple wells, for the purpose of securing information for regulation of the action of the vaporizor. Bottom steam is provided, as well as steam for the jetting action of vapor removal if necessary. The equipment functions to assure a sharp separation between residuum and vapors, providing a residuum of desired flash and high boiling point, and also providing vapors for fractionation that are absolutely clean and free of heavy or colored particles.

The vapors leave the top of the separator or vaporizor through a 12-inch vapor line to be conducted to the bottom, of first section of the multiple stream, multiple compartment, bubble type tower.

Tower

When the Millif Bros. conceived the idea of a multiple stream tower and

subsequently perfected the apparatus they desired, a piece of equipment which not only would do the work of fractionating several cuts or fractions, but which would be "fool-proof," easily controlled, and so designed and constructed that each operative in charge of the devices could easily grasp the essentials of its operation. As a result, the tower, for all its apparent intricacies, is really very simple in mechanical construction. Being a reflux tower, means are provided for the absolute control of each and every bubble tray incorporated in its construction and further, for the control, with ease, of the action of each reboiler section—with the result that the streams fractionated are not, (as they are in many cases) "what you get," but are "what you want."

The tower in operation is shown in photograph, Figure 2. As is shown the apparatus is rectangular, and is 42 feet high, 4 feet by 6 feet being the other dimensions. The tower consists of 7 compartments which are 4 feet by 6 feet by 6 feet in size. Each compartment is then divided into a pan, or fractionating section, and a bottom section—as a reboiler. The photograph shows the platforms and connecting steel steps installed for convenience to the man on duty, making accessible to him all parts and control devices used in conjunction with the tower operation. Each compartment, however, is very similar to all other sections of the tower, and for that reason only one section will be described in detail.

In the 6x6x4 feet compartment there is the upper section of bubble cap pans. There are 6 plates having six bubble caps each, or 36 bubble caps per section; which caps are of the type that extends the width of the plate. A patented liquid level conrtol device is utilized, which consists of a line leading the accumulated condensate and reflux stock outside of the tower and down to the next plate, where it is led into the tower again to flood the lower plate. The level is controlled at the point of exit of the condensate by a weir valve, the manipulation of which makes for variation of the depth of liquid on the plates. This variation arrangement makes it possible to build up as much as four inches of condensed liquid on each of any plate, or to reduce that level to one inch. Also the plates can be drained free of liquid if desired. The line which conducts the liquid back into the tower at a point one plate lower than its source, also is equipped in such a manner that additional reflux material can be flooded into the tower through apparently the same line. Thus a certain flexibility of the fractionation or selection is assured, and though the liquid level is variable as needed, or where needed, it is always under control. For additional guidance, gauge glasses are placed outside of the tower opposite each bubble plate, which indicates to the operator just what his liquid level, or amount of liquid, is on each plate in the compartment or in the entire tower. Figures 3 and 4 show the details of construction for handling this condensate and causing its governed flow from one plate to another plate in exactly the desired or required amount.

Recycling

Each separate compartment is equipped with devices for recycling or spraying. There are six points of entry provided in each section for refluxing material, as is shown in Figure 4. This arrangement assures the distribution of recycle media, and is also an additional direct control device for it assures the placing of recycle stock where it is most needed, either to build up the liquid level in certain plates, where such may be desired, or to cut out spray media from plates which do not require it. Thus each plate in each compartment can be flooded, or not, at the will of the man in charge In this manner each group of five bubble caps can be controlled in its action by and through the control of the temperature and quantity of the condensates going to make up the liquid level, through which the rising vapors must pass. The accumulated condensate in each compartment is finally conducted to the re-

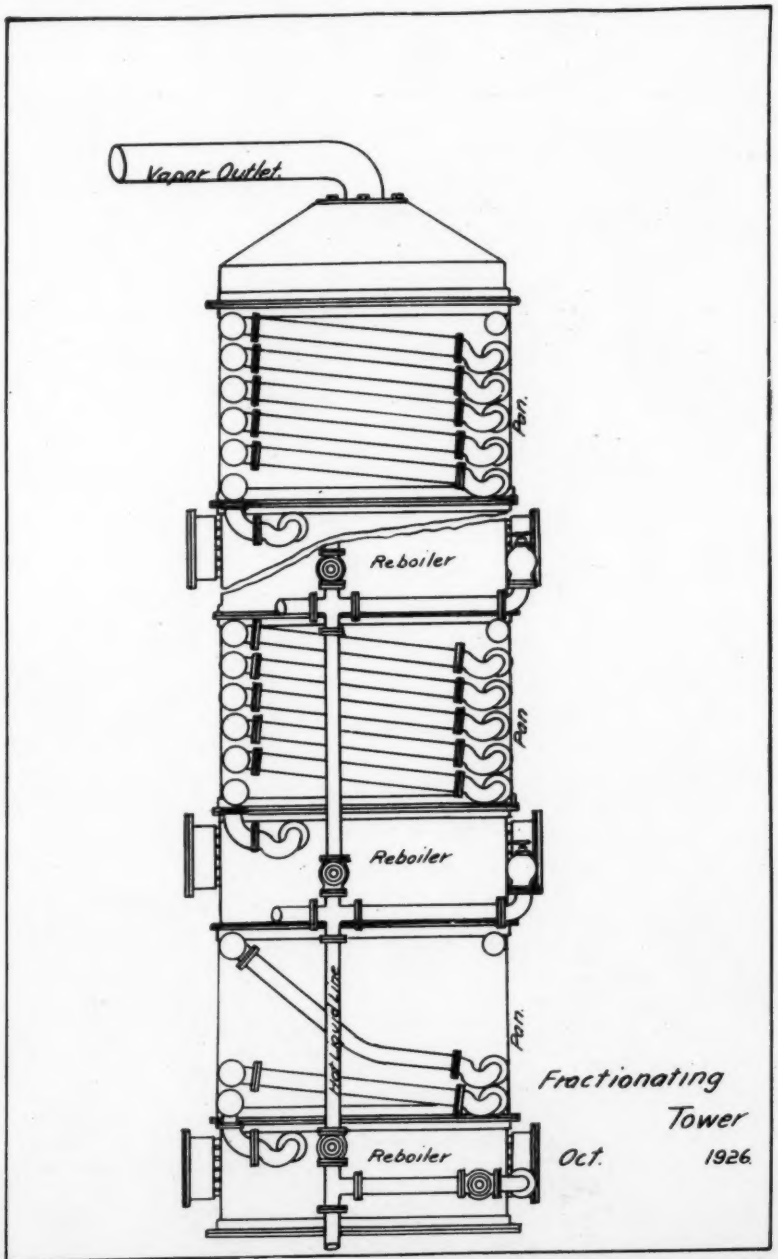


Fig. 3.—Arrangement of transfer lines employed in conducting liquid condensates from one bubble tray to another outside the tower.

boiler section where it passes through some 27 feet of coils and during this travel is exposed to the heat of the rising vapors from the compartment below. In this manner the coils are employed as cooling coils instead of heating coils. They are manifolded, however, in such a manner, that the condensate now passing through the reboiler can be diverted to run down lines, cooled, and stored, while hot residuum is run through the reboiler were such to become necessity. In practice, however, it has been found that the vapors rising through the reboiler section could be cooled a few degrees advantageously. The liquid accumulating in the compartments and conducted through the reboilers, is then removed as finished product, cooled in interchange with the incoming crude oil as previously explained. When necessary, the products derived from any of the compartments can be diverted to the pump instead of the aftercoolers, and then employed as recycle media where needed.

Fig. 5.—Pyrometer and recording instruments in control room of the eight-steam tower unit

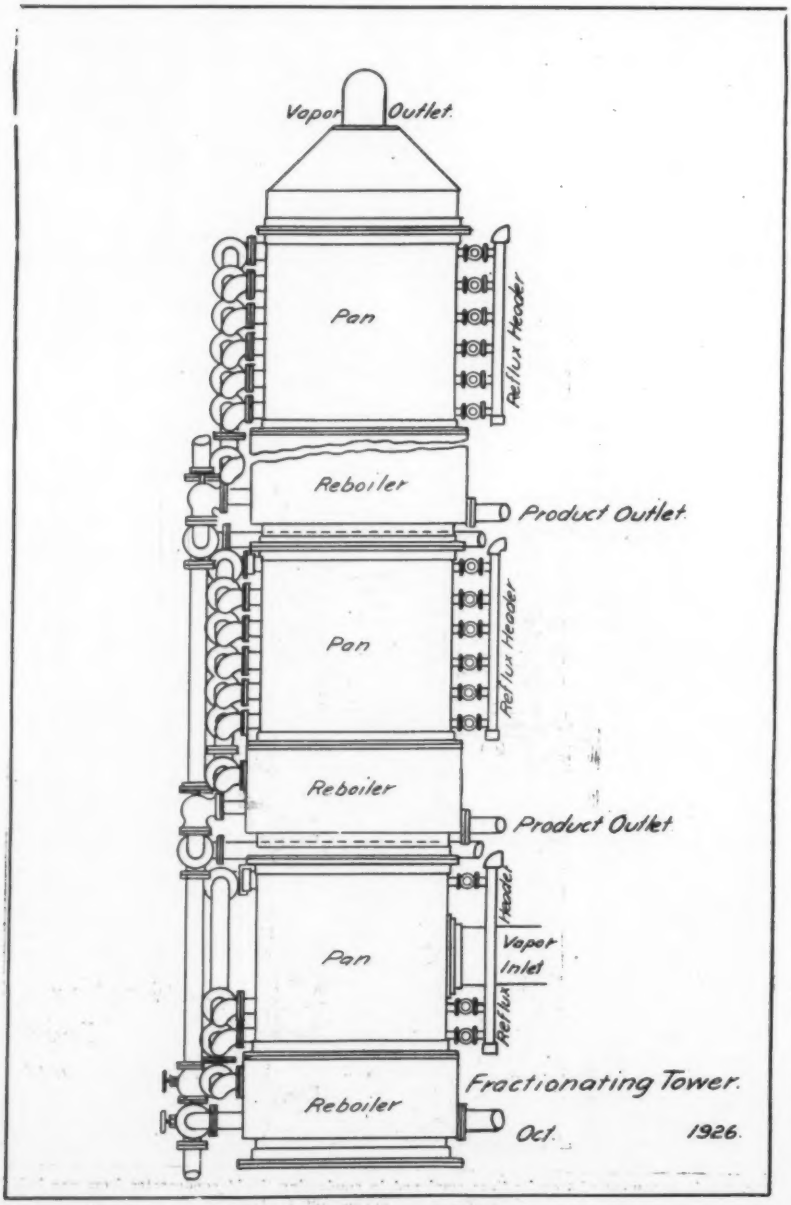


Fig. 4.—Arrangement of reboilers and bubble cap sections of the multiple compartment tower.

Control

Since the condensate of each of the seven sections constitutes a separate fraction off the crude, the tower, probabaly, could be termed as seven towers in one, for each compartment fractionates or condenses a certain predetermined portion of the rising vapors and delivers its condensate to the receiving house. Each section is separately controlled and to all practical purposes functions independently of the other compartments. The temperature of each compartment is recorded on separate Foxboro 24-hour recording instruments. The control board is shown in Figure 5. By means of various types of control devices, controlling, temperature, liquid levels, rate and type of recycle feet, each six feet of the tower is made to deliver as condensate a separate and distinct fraction of the vapors or crude. No trouble with back pressure has occurred during the period of the towers operations, and the fuel oil consumption of this plant is materially lower than units of other types operated by the same company.

Flexibility

The equipment is very flexible and can be adapted with ease to changes in the type of crude charged to the unit. The writer inspected plant reports covering a month of operating, during which time the crude charged was 28 gravity and 21 gravity on alternate days, which points to the condition of flexibility of operation, for the quantity and quality is vapors fractionated greatly varied with each days run.

Plant reports covering yields and percentages, etc., daily for the past year indicate that the percentage of gasoline recovered from this one heating, multiple-stream plant as compared with the laboratory analysis of the crude being charged to the retort, checks within one-half of one per cent.

(Continued on page 40.)

Cooling As Applied to Natural Gasoline Plants

Read before October meeting of California Natural Gasoline Association

By H. J. MAXWELL
Standard Gasoline Company

There seems to be a difference of opinion regarding oil cooling as required in the natural gas absorption plants of today. This fact is verified by the different methods used throughout the industry. Oil to water heat exchangers used in conjunction with an atmospheric cooling tower and open cooling coils placed in the cooling tower spray seem to be the most successful methods, although refrigeration is being applied with very good results.

It was the writer's opinion that the open coil placed in the cooling tower spray was the most reliable and inexpensive installation. With this in mind, an attempt was made to make improvements on this method of oil cooling—not to obtain a high rate of exchange per unit area, but to obtain the lowest ultimate temperature of the oil leaving. It is of very little importance whether the rate of exchange is 80 B. T. U. or 10 B. T. U., so long as the temperature of the oil leaving the cooling system is low and the cost of the installation is reasonable.

There are two distinct problems to solve. One is a properly designed cooling tower to cool the water within a few degrees of wet bulb and the other is arranging the coils so as to get all of the cold water on the surface which is to be cooled.

Two Problems

The first question to present itself is one of much importance. Should evaporation upon the coil surface be encouraged by merely wetting the coils or should they be flooded with plenty of cold water, so as to carry the heat away as sensible heat in the water? When coils are steaming, it is a good indication that the water next to the pipe and the pipe surface is fairly warm. This reduces the temperature difference between the oil and the water film and in turn reduces the amount of heat transferred per unit area. On the other hand, if the coils are flooded with cold water, the surface of the pipe drops in temperature, increasing the temperature difference and the amount of heat transferred. It follows then that the rate of heat transferred from the hot oil through the coil to the cooling water is not a function of whether the heat is dissipated as latent heat or sensible heat, but is a function of the temperature difference between the warm oil and the water film on the coil surface.

From past experience it has been found that with good spray conditions and a properly designed tower it is possible to cool three pounds of water per square foot of tower area from 10 degrees above wet bulb to within two degrees of wet bulb. The design of this tower will be discussed later.

After the water has been cooled to within two degrees of wet bulb temperature all of it must be made to stroke some portion of the coil, thereby creating a large temperature difference between the oil and the outside water film. The arrangement which has been tried and found very satisfactory consists of 24 runs of 2-inch galvanized pipe in series with a rated capacity of 50 gallons of oil per minute. The warm oil enters the tower four feet from the pit floor and passes through 12 horizontal runs in series. The oil is then passed through 12 more horizontal runs four feet above and directly over the first 12 runs. A cooling tower 16 feet wide will provide space for four sets of coils, providing the pipes lay very close together.

The cooling tower is 16 feet wide, 40 feet high and 60 feet long, with wide louvre construction on the sides about half way up the tower. The top half of the sides and the ends of the tower are boarded solid. Sprays are made from 1-inch pipe with saw slots on the bottom side and are welded on 12-inch centers to two 4-inch water headers running along the top and the entire length of the tower. This makes a total of 120 sprays for a tower 60 feet long.

Cooling Capacity

Since this tower will cool three pounds of water per square feet of area, it can accomodate approximately 350 gallons per minute or approximately three gallons per minute per spray. The condition of the sprays and the pressure drop across them are very important, since temperatures near wet bulb cannot be reached in this type of tower unless the water is broken up into a very fine mist.

On the ordinary installation, the amount of heat accounted for as sensible heat in the pit water is much less than the heat taken away from the oil and is mainly due to the fact that considerable evaporation has taken place upon the coil surface. In the tower mentioned above, practically all of the heat taken from the oil can be found as sensible heat in the cooling tower pit water, except the small amount dissipated while the water is dropping from the coils to the pit. No doubt some evaporation takes place on the coil, but the amount of cooling from this source is so small where the coils are flooded that it can practically be forgotten. It then follows that the rate of exchange on flooded coils is not a function of the wet bulb temperature, except that the wet bulb governs the temperature of the water striking the coils.

Average Tests

An average of several tests in the Ventura field tends to support this reasoning, as the following results will show:

Wet bulb, 62 degrees. Water circulation, 355 gallons per minute.

Dry bulb, 72 degrees. Water over coils, 64 degrees.

Oil circulation, 1260 pounds per minute. Water in pit, 73 degrees.

Oil in, 110 degrees. Oil out, 65 degrees.

Cooling range, 46 degrees.

1260 x 46 x .5 equals 28,980 B.t.u./min. taken from oil

355 x 8.3 x 9 equals 26,514 B.t.u./min. sensible heat in water.

There is approximately 2400 B.t.u./min. that we assume is dissipated while the water is dropping from the coils to the pit floor and a small amount of evaporation upon the coil surface.

There are several of these towers in operation on oil cooling service and the cold oil leaving the tower ranges from two to five degrees above wet bulb temperature, depending upon the atmosphere and the conditions of the sprays. In every case the rate of exchange compares very favorably with that of the closed water to oil exchanger as far as a heat balance is concerned.

At a glance it may be said that 5760 feet of two-inch pipe and a 16 x 60 x 40 foot cooling tower with 355 gallons per minute water circulation is very inefficient to cool only 180 gallons of oil per minute. The answer is that the lowest ultimate temperature of the oil at a reasonable cost is the important feature, regardless of what the B.t.p./sq. ft./deg. diff./hr. is.

Table of Material and Labor Basis For Construction Work

Basis for estimating cost of construction given on every plant item in one chart

By ALEXANDER B. MORRIS

IN estimating the cost of construction work, much time and labor are expended in digging through engineering hand books for data on the quantity of each of the several kinds of raw material that go to make up some structural element, and the amount of labor required to be performed to put the raw materials in place. After these elementary data are at hand they have to be worked up into form to apply to the particular time and place for which the figures are being prepared.

With a view to eliminating much of this research work, the accompanying chart has been prepared. The information contained therein was obtained from a number of construction hand books and was modified in many details by competent engineers familiar with oil field practice, so as to conform more closely to conditions in this industry. The range of different kinds of "finished work" listed at the left side is sufficiently large to include practically all lease or station construction work other than machinery and piping. Across the top are the raw materials as available to the purchaser, which enter into these kinds of finished work; and the classes of labor required to convert these raw materials into a structure or part of a structure.

The units of finished work are such as would be commonly used in treating of each class, and are obtained by measurement from plans or from actual inventory in the field, in the case of a valuation job. The units of raw materials, similarly, are those in which is commonly measured; and the quantities shown in each column apply to the number of units of raw material (in the unit shown at the top) that are required to construct one of finished work (in the unit shown at the left).

Transportation costs can be figured by the use of the weights shown for the raw materials, using a ton mile cost determined by local conditions. Labor units are the man-day.

The use of the table will be made clear by an example. Supposing we wish to build a corrugated iron or wood frame engine house with 6-inch concrete floor and concrete foundation, ten miles from rail. We can obtain five ton-trucks at $50 per day and each truck will make four round trips, a cost per ton mile of $0.25. Material and labor prices are inserted to represent some particular set of conditions. These, of course, will vary with time and place.

Such a building, regardless of size, consists of

1. Concrete foundation, and engine bases.
2. Wood forms.
3. Wood framing.
4. Corrugated iron, nailed on.
5. Concrete floor base.
6. Cement finish, for floors and walks.
7. Windows.
8. Doors.
9. Excavation for foundation and engine bases.

Now consult the table. Opposite "concrete" at the left we find:

Cement, 1.57 bbl. @	$3.60	$5.65
Sand, 0.44 cu. yd. @	2.00	.88
Crushed rock 0.88 cu yd @	4.00	3.52
Labor 0.2 day @	4.00	.80

Teaming	Pounds
1.57 x 400 pounds	628
0.44 x 3000 pounds	132
0.88 x 3000 pounds	264
	1024 .512 tons

0.512 tons @ $0.25 per ton mile, ten miles ..... $ 1.28

Total cost of concrete in place measured from drawings. Per cubic yard $12.13

Opposite "wood forms", at the left, we find, for each thousand feet board measure indicated by measuring the surface to be supported.

Framing lumber, 1.1 M B M @	$40.00	$44.00
Nails, 30 pounds @	.15	3.00
Carpenter, 4 days @	8.00	32.00
Carpenter foreman, 2/3 days @	9.00	6.00

Teaming	Pounds
1.1 x 3500 pounds	3850
	20
	3870 1.935 tons

1.935 tons @ $0.25 per ton mile, ten miles ..... $ 4.84

Total cost of wood forms in place, per M B M $89.84
(Measured from drawing of finished work.)

Opposite "framing lumber" at the left, we find

Framing lumber, 1.1 M B M @	$40.00	$44.00
Nails, 20 pounds @	.15	3.00
Carpenter, 3 1/3 days @	8.00	26.67
Carpenter foreman, 5/9 days @	9.00	5.00
Teaming 1.935 tons @	2.50	4.84

Total cost of framing in place per M B M $83.51
(Measured from drawings of building).

Opposite "corrugated iron" at the left ,we find

Corrugated iron, 1.15 sq @	$9.00	$10.35
Nails, 5 pounds @	.15	.75
Carpenter, 1/7 day @	8.00	1.14

Several More Dubbs Units Installed

Chicago, Ill.—Universal Oil Products Company has recently sold a number of Dubbs Cracking Units to be installed in new refineries and in improving old ones.

The Standard Oil Company of California is starting construction on seven additional Dubbs Cracking Units in their Richmond refinery. These units will be of similar type to the one unit which has been operating there for several months. Each unit will have a capacity of 3000 barrels of charging stock per day, and is capable of yielding 1500 barrels of gasoline per day. These are the largest cracking units in existence.

The Shell Company of California has started on the installation of eight Dubbs Cracking Units in their Dominguez, California refinery. Each unit will have a capacity of 1500 to 1800 barrels of charging stock per day, and will be capable of producing 800 to 1000 barrels of gasoline per day per unit. This installation is in addition to the eight Dubbs Units which they are now operating in their Wilmington refinery and the nine Dubbs Units in their Martinez refinery.

The Paragon Refining Company are now constructing two Dubbs Units in their Toledo refinery. Each unit will have a capacity of 1500 barrels of charging stock per day.

The Curacaosche Petroleum Industrie Maatschappij are installing four additional Dubbs Units in their Curacao refinery. This will give them a total of eight Dubbs Units at this place.

Metal worker
1/7 day @.....8.00 1.14
Teaming, 124 lbs.
5

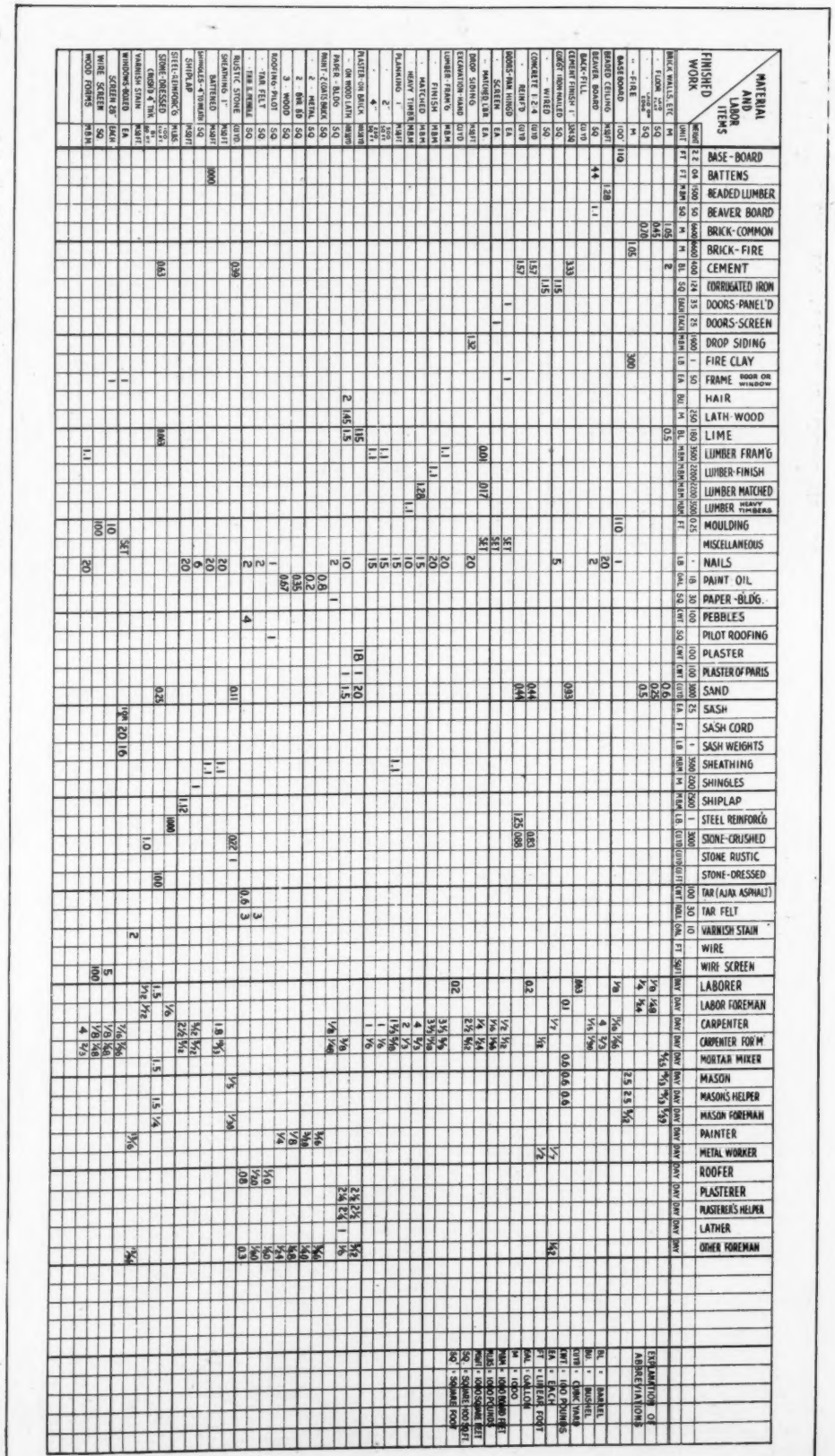
129 lbs. 0.0645
ton @ .....2.50 .16

Total cost of corrugated iron in place, per sq. $13.54
(Measured from drawing of finished work.)

Cement finish 1-inch thick is figured in the same way. These unit costs are then applied to the several elements enumerated above, the quantities of each element being determined by the size, shape and type of construction to be used. Thus several small engine bases will measure up more surface and hence require more lumber for forms than one large one, though the amount of concrete might be the same. Likewise a building with studding spaced 2 feet on centers would require more lumber than if a 5 feet spacing were used. Also, caps, plates and belts, the size and number of each would materially affect the amount of framing lumber as shown by the plans. Concrete for floors and walks is computed on an area basis at 1-inch less thickness than desired, and the remaining inch is made up of cement finish, separately figured. Windows and doors, in number, size and cost depend on the building plan, but all can be provided for from the chart.

For reconstructing the cost of a building for which actual cost figures are not available, as is generally the case in oil field practice, this table is of great value. It presents a ready means of evaluating any building for insurance purposes, and will render the adjuster's work much less difficult in case of a loss. The feature of greatest value, however, is the fact that it may be applied to any time and any place, merely by changing the price units for material, labor and teaming.

Tulsa, Okla.—The Burt Corporation of Tulsa has been appointed manufacturer's representative in the Mid-Continent field for the Ohio Injector Company of Wadsworth, Ohio.



Flood Lights used by Refiners in the North Texas District

More Light at Lower Cost

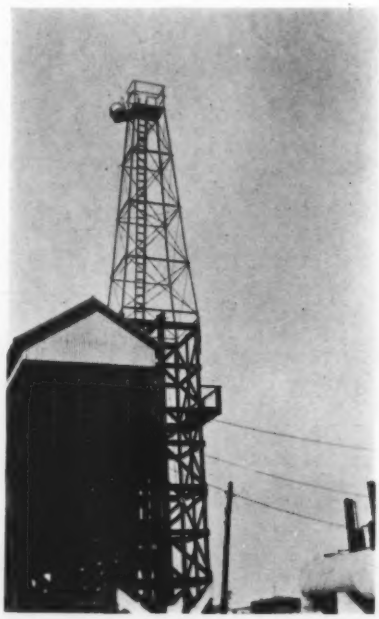
Panhandle flood-light installation at Wichita Falls proves efficient

By RALPH E. GOODE

THERE are a number of refineries in the Wichita Falls area using the flood-lighting system for the general lighting of their plants and with this system of getting a greater lighting efficiency with a much lowered cost of electric power and upkeep than can be had with the system of hundreds of 75 watt and 100 watt lamps placed here and there at every rundown tank and corner of the plant the "flood-light" has more than proved its superiority.

The Flood-light or Searchlight as it is sometimes called is a reflecting lamp of great power of either 500 or 1000 watts capacity. The flood-light can produce more than 40 per cent better light than that number of single 75 watt or 100 watt lamps divided into the flood-light of a given rate. Mounted upon a tower of sufficient height for the plant's needs with lens and reflector in proper focus one 1000 watt flood-light will light more than 30 acres of ground to a degree sufficient for reading a newspaper at a late hour of night. The flood-light is the locomotive head-light adapted to the industrial needs of the modern refinery or any other concern requiring a well lighted area of working ground. Its use in connection with the refining of crude petroleum marks a forward step.

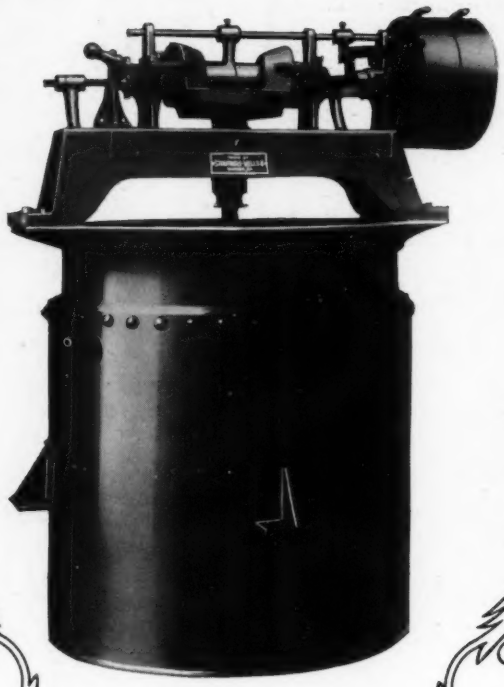
The elimination of the shadow cast by objects about the small 75 watt lamp at night enables the employee to better perform his work. The more accurate gauging of tanks and the safety factor are notable physical reasons for the flood-light installation and also a very important consideration to the plant superintendent and officials of the company is the greatly lowered cost of electric light power with increased plant efficiency. It has been found that the cost of the flood-light installation is much less than the installation cost of a great number of small lamps and that the electric light charge is considerably lessened with the flood-light installation. Where one connection must be made with the flood-light a great number of connections must be made for the number of small lamps needed to equal the work done with the flood-light. Naturally the cost of electricity is less with the larger lamp because with its reflecting power less is needed.



Tower built in connection with other equipment

Cost Less

The Panhandle Refining Company of Wichita Falls has had in use the flood-light installation for some time and have one of the best lighted plants in the mid-continent territory. By installing the flood-lighting system they were enabled to eliminate 16,000 watts of small lamps and replace these with three 1,000-watt



Struthers-Wells Products for the Refinery Field

Bubble Towers
Heat Exchangers
Dephlegmators
Condensers
Distillate Separators
Grease Mixing Kettles

Jacketed Grease Mixing Kettle for Refinery Service Illustrated.

THIS is merely representative of the hundreds of metal containers made by the versatile manufacturing facilities of the Struthers-Wells Company.

Whether the construction calls for welded seams or riveted joints, mixing kettles or cracking stills, the Struthers-Wells organization has the resources and skill to meet any specification in the refinery field.

If it's made of steel plate, let Struthers-Wells do it.

"Anything in steel plate construction of stainless steel"

STRUTHERS-WELLS COMPANY

Warren, Penna.

MANUFACTURERS ENGINEERS

STEEL PLATE CONSTRUCTION
CHEMICALS—REFINING RUBBER
Branch offices in principal cities

75 Years of accumulated experience at your service

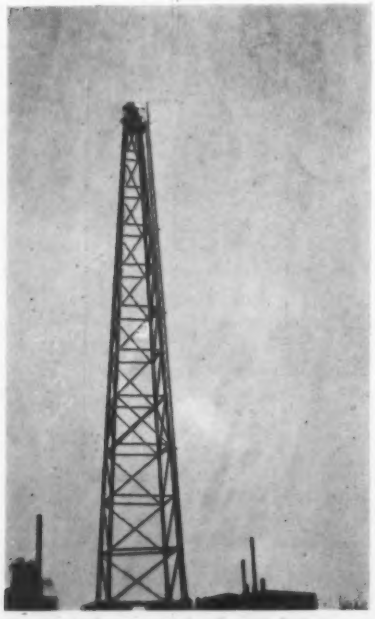
STRUTHERS-WELLS
Steel Plate Construction

Mention Where You Saw the Advertisement

flood-lights. With this they are getting more than 75 per cent better light, as they have them arranged than was the case formerly with the small lamps. This at a saving of 13,000 watts. By installing their own power plant and using the flood-lights along with other plant adjustments, they cut power costs $800 per month and always have uninterrupted service. The light company's charge for power for industrial purposes averaged 3.25 cents per kilowatt hour and with the plant using 160 kilowatts daily for lighting purposes the lighting charge was averaging better than $156 per month. With the flood-light installation and their own power plant they cut the cost of manufacturing electric power to 1.2 cents per kilowatt and effected a saving of $145.20 per month on the electric light charge alone. This with a 75 per cent better lighted plant and a plant electrician on the payroll.

Forty foot pipe tower for mounting flood light. Tower is set in concrete. The raiser is 4-inch pipe, climbing studs three-quarter inch iron, brace for the light platform is 2-inch iron.

The power plant consists of two Diesel engines of 300 combined horsepower burning gas-oil for fuel. These engines are connected each with a 150KVA and a 90KVA generator respectively and may generate a maximum of 200 kilowatts. They are arranged to operate as one unit or one may be shut down while the other operates uninterruptedly. They consume on an average 269 gallons of 30 gravity gas-oil daily and use four and one-half quarts of lubricating oil daily. They are generating at the present time an average of 63,100 kilowatts per month at a cost of approximately $757.20. However, if they were not in need of electric power except for lighting purposes and were without their own power plant, but using the flood-lighting system, the difference in favor of the flood-light over that of the small lamps would be considerable. For instance, where the power plant is not a part of plant equipment and the flood-light installation is in use three 1,000-watt each flood-lights cost per month at 3.25 cents per kilowatt hour, $29.25. Using the small lamps of 75 watt to a number equalling the flood-light the charge is $156 per month, which means a saving of $126.75 in favor of the 1,000 watt flood-lights.



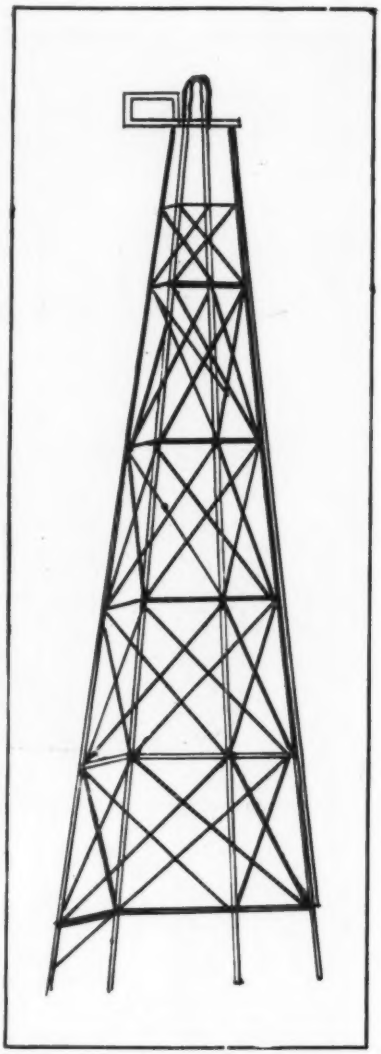
Derrick Tower used for flood lights at a North Texas plant

Tower Construction

The cost of the flood-light installation varies, according to different conditions, but ordinarily constructing the tower and installing a flood-light costs approximately $300 with the 1,000-watt lamp. The manufacturing cost of the flood-lamp most used is $190, the cost of constructing the tower is $100, and incidentals $10. At the Panhandle plant a 66-foot tower was constructed of angle iron, the risers being made of 3 x 3-inch angle iron and the cross members of 2 x 2-inch angle iron. With other installations the tower was constructed of pipe—4-inch pipe for the risers and 2-inch pipe for the cross members and braces. The cross members being placed four feet apart in the 66-foot tower, forming an X in the centers. However, any plant installation of sufficient height with the proper locality may be utilized for mounting the flood-light such as the dephlemator tower of the Dubbs Cracking Plant or a large storage tank which naturally means a saving in installation costs. Such is the case with several plants at the present time, but the specially constructed tower seems to be preferred.

In installing the flood-light it has been found desirable to place ventilating holes through the front side of the lamp near the edge at the top and bottom for aiding in keeping down the temperature of the lamp while burning. Few of the lamps are prearranged in that manner. The ventilating holes will allow for a considerable draft of air through the lamp at all times. The high-power lamp develops considerable heat during burning and although this does not affect the lamp it has been found desirable to keep the light at an average temperature. The ventilating holes where they are used have a wire screen covering and a top for keeping out insects and moisture.

In installing the flood-lights at the Panhandle Plant the lamps were arranged as follows: One is mounted upon an angle iron tower at the southwestern edge of the plant looking down the loading rack, pointing north at a right angle, two are mounted at the 85-foot level on their dephlegmator tower at the southeastern edge of the plant grounds, one pointing northwest and the other west.



Design of flood light derrick, 60 feet high, for mounting flood light. Legs are set in concrete. Uprights are 3x3 inch angle iron. Cross members are 2x2 inch angle iron. The inspection platform and U for holding the lamp are at the top. The ladder is at the right

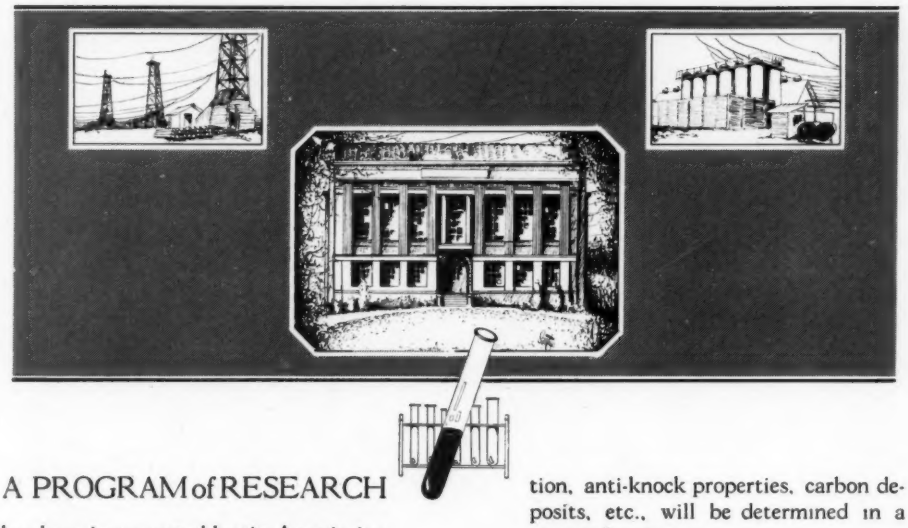
With this arrangement they are getting more than 75 per cent better lighting efficiency than formerly was the case with the numerous 75-watt lamps. By installing the flood-lights they effected a considerable saving in installation cost, as the total cost for the job was $650.

Lights Adjustable

An inspection is made each week upon the installations for any possible trouble likely to develop in the lamp or about the connections and a general inspection is given them at intervals when they are gone over for cleaning, oiling and brightening up. The flood-light may be adjusted if desired for a direct beam of light, or it may be adjusted for giving a wide spreading light for covering a broad area.

In the case of the Panhandle Company they are on a 220-volt circuit and the cracking plant being equipped with recording instruments of 110 volts they found

The TRUE VALUE OF NATURAL GASOLINE



A PROGRAM of RESEARCH

has been inaugurated by the Association of Natural Gasoline Manufacturers, under the direction of

DR. E. H. LESLIE and
DR. G. G. BROWN

Professors of Chemical Engineering
University of Michigan

for the purpose of determining the true value of ***Natural Gasoline*** as a component of Motor Fuel.

Its effect on starting, acceleration, detonation, power development, crank case dilution, anti-knock properties, carbon deposits, etc., will be determined in a series of tests in a

Specially equipped laboratory at the University of Michigan.

The results of these tests will be published periodically in the trade journals for the benefit of the entire Petroleum Industry.

Credit for this program is given to those manufacturers of ***Natural Casoline*** and to those manufacturers of equipment and supplies used by the ***Natural Gasoline Industry,*** whose generous contributions have made this undertaking possible.

Association Of Natural Gasoline Manufacturers

TULSA OKLA.

The Instrument board in the power room that furnishes light for a north Texas refinery

it economical to use a step-down transformer which satisfactorily solves a problem of that sort. Otherwise they would have had to re-arrange completely the lighting circuit.

In a small plant, where elaborate equipment is not required the flood-light has been installed on a tower constructed of a single 4-inch pipe riser of 40 feet in height. Two 20-foot lengths of 4-inch pipe being connected and on the upper end a flat ¼-inch thick by 12 inches in width and 24 inches in length piece of flat iron is welded to serve as platform for the flood-light. This piece is braced with a 2-inch in diameter pipe running back and downward to the pipe riser and welded. For climbing tower and making adjustments or inspection ¾-inch studs are welded at proper distances along the pipe tower. This type of tower is especially suitable for the flood-light of 500 watts or it may be used with satisfaction for the 1,000 watt lamp.

The cost of this type of tower is comparatively small, especially where second-hand pipe is available and sound. The acetylene welder being able to construct a tower of the above description for approximately $25. The pipe being available for $10, the labor item $10, and the cement foundation and incidentals $5. This type of tower, where it is used has been found as satisfactory, efficient and economical as can be desired for general flood-lighting purposes, but the derrick type of tower is preferred where a large area of ground must be covered and where there are obstructions to the light rays, such as the average 55,000-barrel steel storage tank, which rises above 30 feet in height and is of a large diameter.

The metal tower of the derrick type or pipe riser should last indefinitely if well constructed, as fire and wind have virtually no effect upon them and rust and corrosion may be arrested for years by applying a coat of paint.

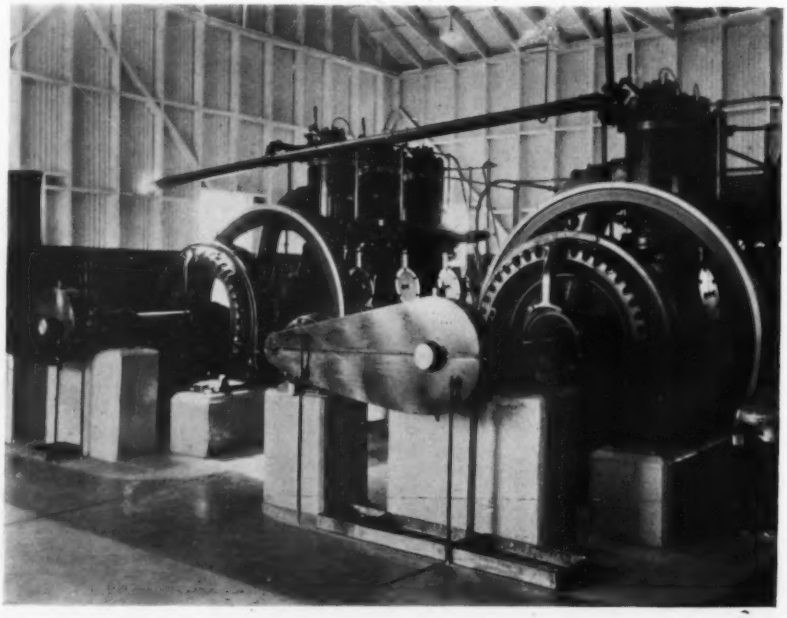
Getting Finished Cuts From Single Tower

(Continued from page 32.)

of the results secured in the standard analysis proceedure used in the laboratory.

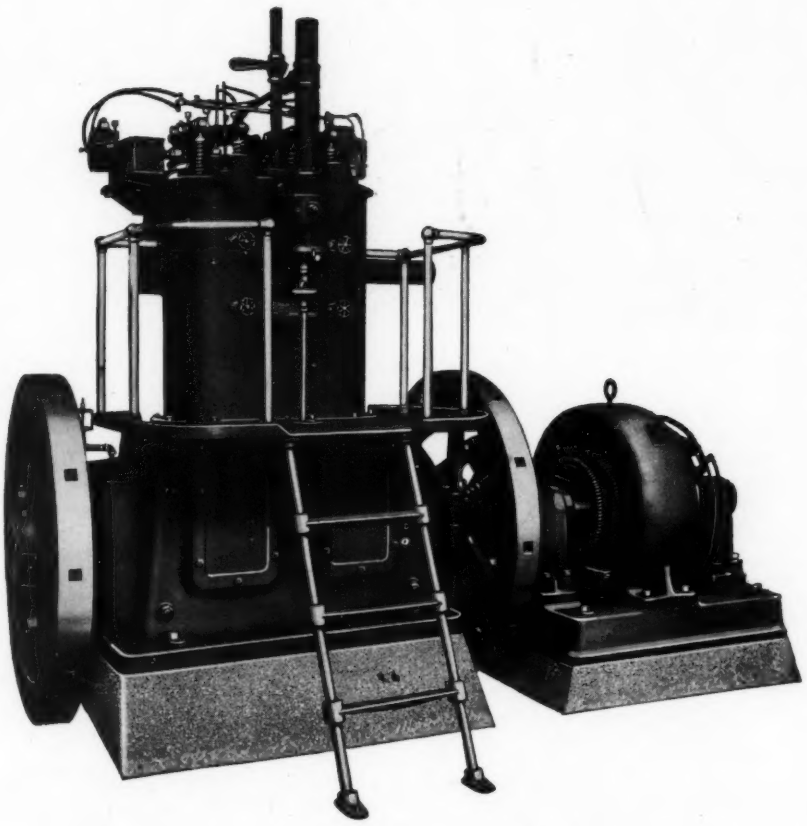
While the tower actually delivers eight streams or fractions to the after-cooling system, the number of finished streams, or fractions, appearing in the receiving house is reduced to five. The streams from sections 1 and 2 are combined to form one stream—gravity 35.5, I. B. P. 405. 10 per cent over 480 degrees F. Section 3 delivers a stream separately with about the following specifications: Gravity, 38.6, I. B. P. 370 dgrees F. E. P. 560 deg. F. The condensatse of sections 4 and 5 of the towers are combined to form one stream, gravity, 40.2 degrees A. P. I. I. B. P. 345 E. P. 535 degrees F. Sections 6 and 7 of the tower produce one stream by combining the two flows, about as follows: 44.9 degrees A. P. I. I. B. P. 260 degrees F., E. P. 450, which is an excellent blending stock, and which is received water white. The vapors overhead from the towers form, of course, the major gasoline stream about as follows: Gravity 50.0 degrees A. P. I., I. B. P. 175, 90 per cent. over, 392 degrees F. End point, 432. This stream is, of course, water white. The stream off of the interchangers and primary vaporizer, 61 degrees A. P. I. gravity, 105 degrees F. I. B. P. and 360 E. P. The crude charged to stills, on the day of the writer's visit when the above data was secured, was 26-27 gravity, showing 24.7 per cent gasoline upon analysis. The fuel oil residuum leaving the interchangers was 20 gravity and flashed at 180 degrees F. Pensky-Martin (closed cup).

The tower and vaporizer and entire refinery systems are being manufactured at present under the name of International Refinery Equipment, the equipment being fabricated at the works of the Union Tank and Pipe Company, Los Angeles, Cal.



Generating room for supplying lights for refineries

The Increasing Number Now In Use Speak For Bruce-Macbeth Quality



The installation, by several large oil companies, of a number of 165 H. P. Bruce-Macbeth engines with 156 K. V. A. alternators attests to the growing demand for Bruce-Macbeth engines.

Write for Information

THE BRUCE-MACBETH ENGINE CO.

J. B. SIMLER, Dist. Mgr.

420 Clinton Bldg., Tulsa, Okla. **Main Office and Works, Cleveland, Ohio**

Mention Where You Saw the Advertisement

Cracking Heavy Hydrocarbons in The Presence of Catalyst

By ISMAR GINSBERG

THE oil industry to-day is vitally interested in the cracking process, for it recognizes that it affords a means of increasing the production of the lower boiling and more valuable products that are obtained from petroleum. There have been numberless processes described in the patent and journal literature and it is really impossible to open a patent gazette from any of the important countries without finding in it a patent on a new cracking process. It is understandable that the great majority of these patented processes are never applied in actual practice and in fact some are of questionable technical value not to mention economic impracticability. Nevertheless it is equally true that the perfect practical cracking process has not been attained as yet and it is indeed doubtful whether there can really be any permanent perfect process. There are improvements being made all the time in this direction, and as the need for cracked products becomes greater, more attention will be paid to improving the process and the apparatus as well. Thus it is a fact that this patent literature while it may not result in any direct practical advantage, affords the technologist ideas which he can perhaps convert into practical terms.

Our article is concerned with a discussion of certain results that were obtained in the cracking of heavy hydrocarbons, mineral oils, mineral oil residues, ozocerite and the like into lower boiling products by heating them to the boiling point in the presence of activated charcoal and other catalyts.

Coke Trouble

The main trouble that is not encountered in this process which is carried out in suitable apparatus, which does not need any explanation here, is the formation of a coke deposit. This is a condition, however, which is prevalent in practically all cracking processes and requires the use of special mechanical contrivances of one sort or another to prevent the deposition of the carbon on the walls of the apparatus. The cracking of the aforementioned products yields gasoline, kerosene and other low boiling products as well as an asphaltic residue which can, however, be worked up into lubricating oil, provided the asphalt is removed from it. This can be accomplished by the regular steam distilling process and evaporation of the distillate or by separation with the aid of standard benzine. It is, however, also possible to carry out this cracking process, using activated charcoal as a catalyst, in such a continuous manner that the residue obtained is almost pure asphalt. Hence the process will yield low boiling ingredients and an asphaltic residue.

From the formation of highly viscous lubricating oils in the residue it is seen that the splitting of the mineral oil residuals results in the formation of individual ingredients on the one hand, and on the other hand these individual ingredients will combine and polymerize to form high molecular weight products. Thus a sample of illuminating oil residuals was treated in this manner. It was found on analysis that there was no ingredient in this residual mass that had a boiling point lower than 300 degrees C, but then the products in the distillates which boil below 300 degrees C, amounting to approximately 43.6 per cent, must have been formed anew during the splitting process. The principal portion of the distillate were members of the hydrocarbon series C_nH_{2n+2}. There were also present hydrocarbons of the unsaturated series, C_nH_{2n} as well as saturated naphthenes. It was found that not only were individual hydrocarbons formed anew during the process, but whole series of substances.

A certain amount of gas is also formed during the process. This amounts to 4.9 per cent, the starting point being as heretofore illuminating oil residues. This gas consisted of carbon dioxide and sulphuretted hydrogen, hydrocarbons of the olefine series, oxygen, carbon monoxide, hydrogen, hydrocarbons of the methane series, (principally methane) and finally nitrogen. About half of the waste gases were formed of methane about one-third of olefines and about one-tenth of hydrogen.

It has been mentioned that the cracked products, resulting from the cracking of heavy hydrocarbons and the like, tend to combine and polymerize to form higher boiling products. This is, of course, detrimental to the success of the process at least under certain conditions. It is thus important to understand the factors which determine whether or not this will take place and to what a degree it will happen. These factors are, of course, the temperature at which the cracking is carried out, the pressure which is used and the time during which the oil is heated.

Lower Boiling Point

A study has been made by Dr. Herbst in an article contained in Erdoel and Teex, 1926, in connection with an investigation which he has made on the cracking of heavy oils in the presence of various catalysts, of which article this present paper is in the nature of a paraphrased translation.

This study has enabled the conclusion to be reached that the decomposition of a higher boiling point hydrocarbon belonging to the saturated series will result in the formation of a lower boiling product of the same series, together with an olefine hydrocarbon. For the most part methane is formed and the unsaturated hydrocarbon. When this takes place then the greater part of the chain of carbon atoms is contained in the unsaturated olefine, while the methane represents the simplest form of the saturated hydrocarbon.

It is pointed out by Dr. Herbst that it is also possible that the saturated hydrocarbon molecule of high molecular weight will be split into two new hydrocarbons of the same series of lower molecular weight and an unsaturated hydrocarbon of the series C_nH_{2n-2}. However, experience has shown that this decomposition takes place to a very slight degree as compared to the other. Acetylene may be produced in this manner, but it will ordinarily be polmerized and benzol will be formed. The hydrocarbons of the above series known as alkines can also be readily cracked further with the deposition of carbon, and the formation of aromatic hydrocarbons. This process will take place at a temperature of 300 to 650 degrees C. In this connection it is also brought out that a series of substances have the power of influencing the progress of this reaction, these being the metals iron, copper, nickel, etc.

This is rather an important matter for the process can not be considered to proceed in a proper manner if deposition of carbon takes place with resulting loss of hydrocarbon values and for this reason aluminum vessels have been selected in which to carry out the cracking process, for aluminum does not act as a catalyst and enhance this decomposition of the alkines.

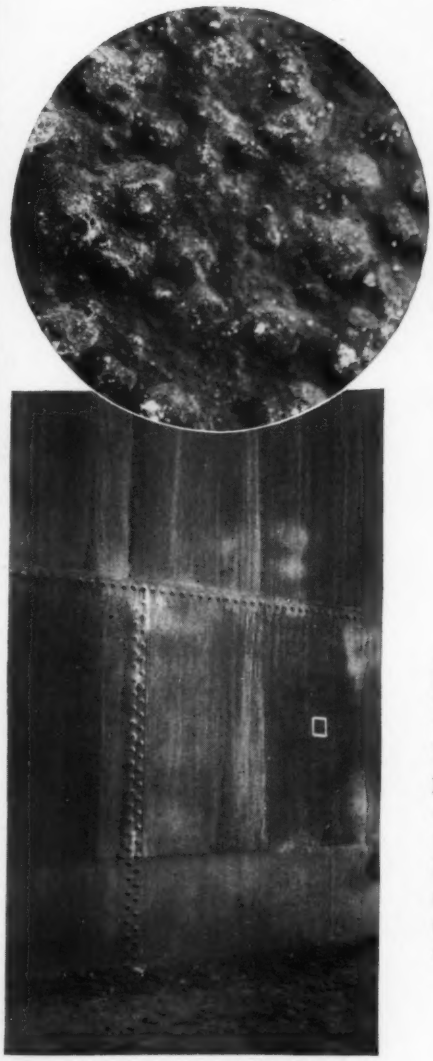
An interesting subject in connection with the cracking of hydrocarbons of higher boiling points has always been the possibility of converting them into aromatic compounds. Much time was spent in investigating this matter during the war when sufficient supplies of the important aromatic hydrocarbons, benzine, toluene and xylen were lacking. The results were unsatisfactory, for while it was demonstrated that it was possible to obtain aromatic hydrocarbons from petroleum hydrocarbons, nevertheless the yields were altogether too low to make the process a feasible one from a commercial standpoint.

Use of Towers

A part of the investigations, which Dr. Herbst describes, on the use of activated carbon in the splitting of hydrocarbon

(Continued on page 58.)

"Close-ups" Speak Louder than Words



Unretouched photomicrograph (125 diameters) and unretouched photograph of aluminum coating on weather side of an Oil Tank, taken September, 1926. Coating applied November, 1925 by long established paint manufacturer over his own primer.

Those posted on Aluminum Paints, will know at a glance which of these photographs shows

Bitulumin

"The Successful Aluminum Paint"
of
proven
deflectivity,
durability,
economy.

IT is apparent that the liquid vehicles ordinarily used in the making and mixing of paints will not do for an Aluminum Paint that is to last. A special vehicle must be used and, more important, it must be compounded with infinite care.

Unretouched photomicrograph (125 diameters) and unretouched photograph of Bitulumin coating on weather side of an Oil Tank in same location as other tank, taken the same day. Bitulumin applied over our number 250 primer, November, 1925.

ALUMINUM flakes provide a lasting outer sheathing if held in place. Why, then, throw this value away by using a liquid vehicle which is not inhibitive in character and which will fail as a binder. Why experiment?

Concise Data Booklet on request

HILL, HUBBELL & COMPANY

Technical Paint Specialists

SAN FRANCISCO	LOS ANGELES	TULSA
115 Davis St.	331 W. Eleventh St.	P. O. Box 1483
SEATTLE	**PORTLAND**	**BALTIMORE**	**NEW YORK**
816 Western Ave.	51 First St.	600 E. Lombard St.	15 Moore St.

Pressure Equipment Requires Expert Inspection

By FRANKLIN L. NEWCOMB
Engineering Department of the Standard Oil Company, New Jersey

IT is apparent that practically every operation about a refinery has the potentialities of being a hazard. There are three main factors which enter into the safety of these processes.

1—The equipment used must be suitable for the job, that is, it must be made of the right material, properly put together and of ample strength. This is a problem of design and an engineering function.

2—The proper methods must be used in handling the equipment and performing the various operations. This is a problem of operation.

3—The equipment must be kept in good condition at all times. This is a problem of inspection and maintenance.

Only a comparatively few years ago, most of the design was by rule of thumb. The operating man said what he wanted and the foremen of the various trades did the rest. The boilermaker built a still making it as thick as he thought necessary and riveting it together as his experience dictated. Even at that we got a pretty good job because we usually had a pretty good boilermaker foreman. It was the same with the pipe-fitting, masonry, and so on.

Seek Correct Materials

But they did not always get the material best suited for the conditions, nor did they always make proper provision for all of the strains. Today, our large companies all have well organized engineering departments and equipment is being designed scientifically. Investigations are being made into the most suitable materials to be used in different locations and under various conditions. Cracking and other pressure equipment particularly is receiving intensive study.

Taking the second fact, that of employing the proper methods in the handling of the equipment and performing the various operations, our operating people are giving it considerable attention today. Processes are being studied and analyzed by our executives. In some companies well organized departments are making careful research to find the best methods of operation, not only to get the maximum yields of the most valuable products, but also to avoid accidents and fires which may result in long shut-downs for repairs.

Our third fact, that of keeping the equipment in good condition, is being handled in two ways. Maintenance forces composed of mechanics, make periodic visual inspection of the equipment, usually during each cleaning period and make such repairs as appear necessary. This is, of course, an absolute necessity to keep the equipment operating.

Engineering Inspection

Some of our companies have also an engineering inspection force to make more exhaustive inspections of equipment than can be done during the cleaning period by the maintenance forces. These engineering inspection forces were an outgrowth of the advent of cracking. After cracking equipment had been in operation for a number of years, serious failures began to occur and the industry began to make an investigation. It was found that cracking equipment deteriorated quite rapidly, especially in some particular places. As it operated under considerable pressure, it could not be permitted to go until leaks occurred or a sharp blow from a hammer would indicate a weak spot.

So gradually these engineering inspection forces were built up to make periodic, systematic inspection of the equipment.

The deterioration in cracking equipment is difficult to determine, as it is not visible to the eye, there usually being no marked pitted or corroded areas. Generally the metal has the same smooth appearance as when new. However, the deterioration is not uniform, but often occurs in long waves which cannot be seen and for this reason it is difficult to locate the thinnest spots.

Parts thinner than others can often be found by sounding with a light hammer, but it takes an experienced and trained man to know the sound. Due to the nature of the deterioration, it has become generally the custom to drill holes in various parts of the equipment to determine its actual thickness. These inspection forces also check over all parts of the equipment including pipe, valves, gauges, safety valves, etc., and check up to see that the refinery's maintenance forces, are keeping everything in a safe condition.

Inspection Being Widened

The field covered by these engineering inspection forces is being gradually widened and inspections have been made of storage tanks, gas absorbers, gas holders, air receivers, acid and alkali eggs and such things. Men trained to inspect cracking equipment are admirably fitted to inspect any pressure equipment.

Although all the foregoing is being done for safe operation of the actual refining equipment, I believe your accident records will show lost time accidents due to failure of various parts of the equipment or to some operation of the equipment, and I further believe that you will find that generally such accidents are of a most serious nature.

Now that we have considered the work being done to make oil refining safe, let us consider what the safety department can do to further this work. It may appear that the engineering department, process operators and maintenance forces are covering the situation, but you can assist materially in advancing this work.

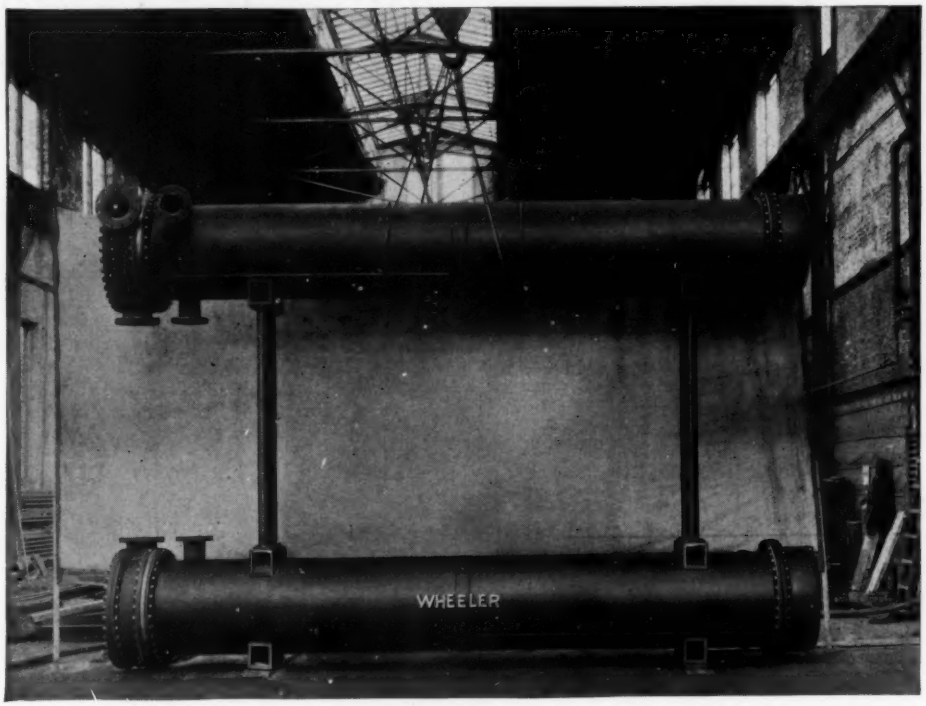
Take the engineering and design. You safety men spend a good part of your time in the plant. You make inspections and you talk to and get acquainted with the men. They talk freely to you. A member of the engineering department does not hear the men's troubles. You can help by reporting what appears to be trouble with some particular kind of apparatus or some particular material, and give the engineering department an opportunity to investigate.

Safety Men Can Help

Almost the same thing applies to the processing operations. Do the men ever tell of the troubles with the methods employed? If they do, do you know enough about the operation to investigate and see if there is any foundation for the complaint? Then is it taken up and followed until a safe method is substituted?

On the maintenance and inspection you can help very greatly. Find the apparatus about the plant that is in need of inspection and then get it inspected. One of our plant safety men has made a list of every pressure vessel in his plant which is not now being inspected, and he is trying to get his superiors to ask for periodic engineering inspection of this equipment. I understand there are 110 pressure vessels on this list. This is what I mean by helping the inspection force.

Then as you get or can make the opportunity, study every operation and piece of equipment and look for unsafe practices and equipment.



$144.00 A DAY!

The Wheeler residual heat exchanger shown above is installed with a continuous still handling 20,000 barrels of crude oil per day. Crude oil entering the still is preheated by means of the hot residuum leaving the battery. An operation test of this exchanger showed the following results:

Hot oil in	560 deg.
Hot oil out	340 deg.
Crude oil in	120 deg.
Crude oil out	240 deg.

Based on the running rate at the time these readings were taken, the exchangers were supplying about 13,500,000 heat units per hour to the crude oil. This means an actual fuel saving to the refiner of at least $6.00 per hour, or $144.00 for a 24-hour day.

A heat exchanger also increases the still capacity as the oil is partially heated before entering the stills and less heat must be transferred through the still bottom per gallon of oil. The through-put is greater and consequently the investment charges less.

Write the Wheeler Condenser & Engineering Co. for further information.

WHEELER
CONDENSER & ENGINEERING CO.
Works, **CARTERET, N.J.**
and NEWBURGH, N.Y.
Main Office—149 Broadway, New York City

WHEELER
Oil Refinery Equipment

HEAT EXCHANGERS
(Liquid to Liquid)
VAPOR HEAT EXCHANGERS
FINAL CONDENSERS,
VACUUM CONDENSERS,
PARTIAL CONDENSERS
THERMO COMPRESSORS.

Other Products Include:

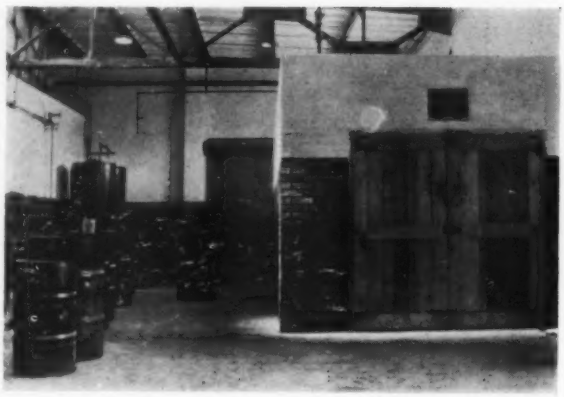
Cooling Towers,
Surface Condensers,
Steam Jet Air Pumps,
Expansion Joints,
Heaters,
Evaporators,
Centrifugal Pumps,
Brass and Copper Tube and Pipe.

LOCAL OFFICES:

Birmingham	New Orleans
Boston	Philadelphia
Chicago	Phoenix
Cincinnati	Pittsburgh
Cleveland	Portland, Ore.
Dallas	Salt Lake City
Denver	Seattle
Havana	San Francisco
Kansas City, Mo.	Vancouver
Los Angeles	

Barrel Drying Room of Simple Design

By H. L. KAUFFMAN



Interior view of a barrel drying room of simple design

ONE of the problems encountered by many refiners and marketers of lubricating oils and other petroleum products, in selling such products in barrel lots, is that of re-conditioning the barrels so that they will again be serviceable.

Common procedures on the part of the refiner or marketer in handling "barrel accounts" are as follows: (1) to sell the barrel outright to the customer, but cleaning and painting it (when necessary) each time that the barrel is returned to the refinery or bulk station, for re-filling; (2) to sell the barrel to the customer, but crediting him with the same, less a reasonable depreciation rate, when the empty barrel is returned; (3) to rent the empty barrel to the customer; (4) to fill the customer's barrels, but charging him for such cleaning and painting of them as may be necessary in order to maintain proper marketing standards on the part of the refiner or jobber. Other methods of handling barrel accounts are in use, but those mentioned represent a few of those most frequently used.

In any case, however, the fact remains that whenever petroleum products are sold in barrel lots, at some time or another the barrels originally containing those products must be cleaned. Exceptions to this rule, sometimesfi are such instances as when the barrel is free from moisture, dirt or other gritty substances, and is so plainly marked as to its previous contents that the same product again can be placed therein. Nevertheless, no used barrel should be filled unless it has been carefully examined as to its cleanliness, and for this purpose special light bulbs and attachments are sold, so as to facilitate the examination.

Five Steps

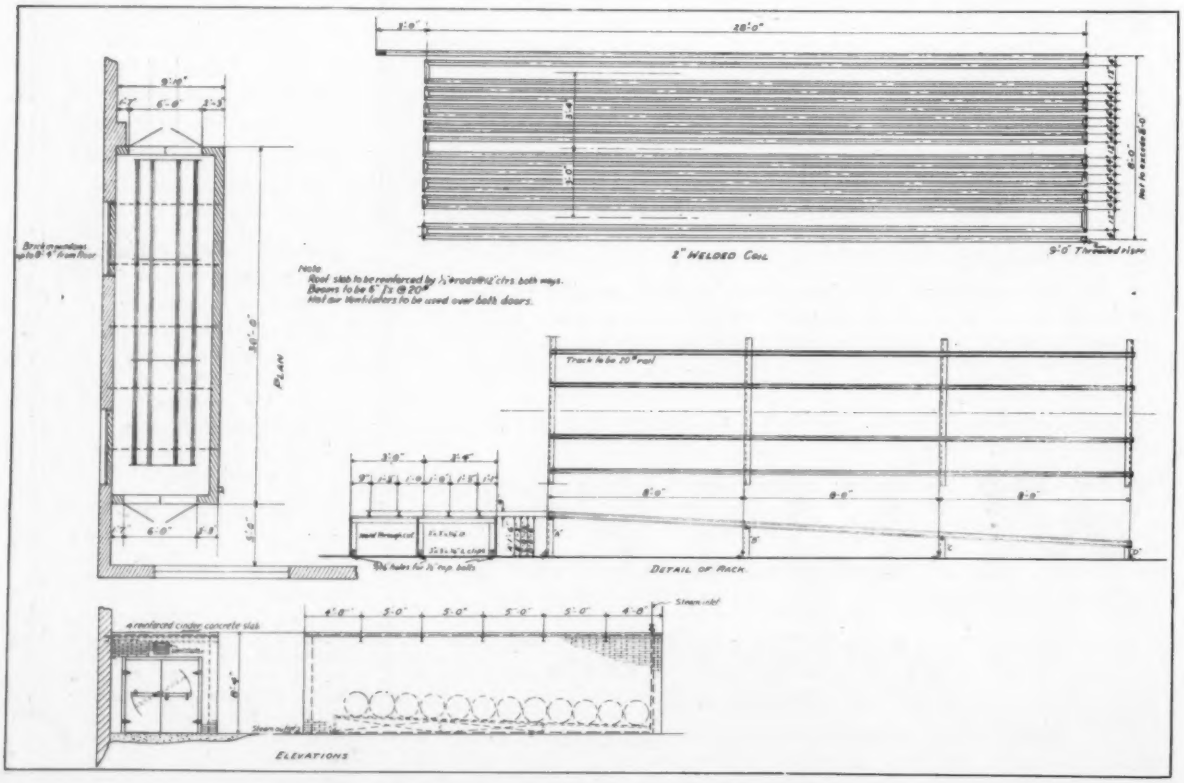
Barrel-cleaning usually involves five essential steps:

1. Steaming, to remove traces of its original contents.
2. Washing, usually with a weak caustic soda solution.
3. Cleaning the exterior.
4. Drying.
5. Painting.

Since failure of the barrels' drying rapidly is most apt to be that step in the re-conditioning of used barrels that hinders the efficiency of the process, *drying* of barrels that have just been cleaned will constitute the main subject matter of the present article.

Fig. 1 shows the plan and details of a barrel-drying room of simple design that has been in use for over a year in the compounding and barrel house at the Parco, Wyoming, refinery of Producers and Refiners Corporation. Fig. 2 shows an exterior view of this same barrel-drying room, built in accordance with the plans shown in Fig. 1.

Prior to the construction of this barrel-drying room, an exhauster and air heater of special design had been tried for nearly a year in the barrel house of this refinery, but for local reasons, primarily, this arrangement for drying barrels proved unsatisfac-



Sketch showing construction of a barrel drying room of simple design

BANROC JACKET

BANROC PRODUCTS

2. Flexible!

This is number two of a series of pages that tell the story of BANROC JACKET.

1. Adaptable
2. Flexible
3. Permanent
4. Reclaimable
5. Efficient
6. Economical

BANROC JACKET is flexible in all directions.

Made of the famous Banroc Wool, felted between rust resisting, copper bearing metal fabrics of various types to give varying degrees of flexibility. It can be bent and formed to fit tight around any curved surface to be insulated. Expansion and contraction of the unit insulated cannot damage or crack the insulation. Joints do not open to cause loss of efficiency.

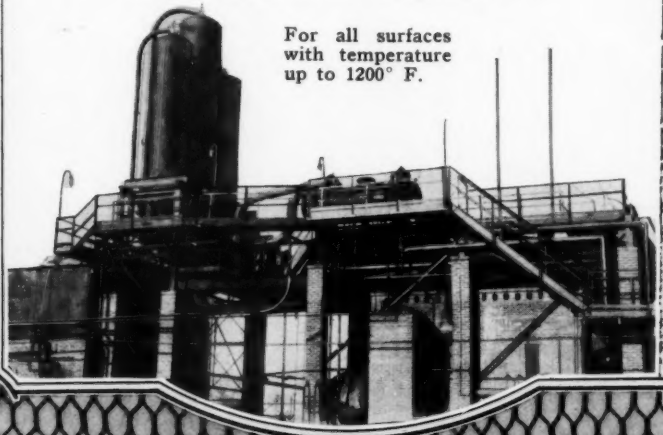
Being extremely flexible, highly efficient, and 100% fireproof Banroc Jacket is particularly adaptable to oil refining equipment, and has been tested and approved and is used by some of the largest in the business.

Made in special sizes to meet your requirements, or furnished in standard sizes, 2x4 ft. and 2x8 ft.

Send us your specifications. Write for samples and descriptive Bulletin 17-R.

BANROC JACKET

100% FIREPROOF INSULATION



For all surfaces with temperature up to 1200° F.

BANNER ROCK PRODUCTS COMPANY

ALEXANDRIA, INDIANA

REPRESENTATIVES IN ALL PRINCIPAL CITIES

tory. The exhauster that was part of the equipment first used had a capacity of 600 cubic feet per minute, the fan of same being driven by a 3 H. P., 220 volt, 3 phase, 60 cycle 40°, 3600 R. P. M. motor. The special air heater consisted of one 3-row and one 2-row Aerofin Unit, with tubes 2 feet long containing a total of 147.8 square feet of heating surface. This heater was complete with casing and also steel plate connections between the heater casing and the fan inlet. Although the design of the heater was supposed to have been such as to raise tht temperature of the air approximately to 195° F., when the heater was supplied with steam at 40 pounds pressure and with air entering the heater at 60° F., as has been mentioned previously, these results were not obtained, because (among other reasons) of conditions peculiar to the refinery itself. It was then that the barrel-drying room to be described was built.

This barrel-drying room is 9 feet 10 inches wide by 30 feet long by 8 feet four inches high, and is capable of drying at one time approximately fifty 55-gallon barrels. A four-inch reinforced, cinder, concrete slab forms the roof of the room, the rest of the structure (with the exception of the doors) being of brick. Double doors of wood, with tar paper between, are located at each end of the room and provide means for placing within and taking out the barrels. Hot air ventilators are placed above each door.

The sloping rack upon which the barrels rest consist of 20-pound railroad track placed as shown in Fig. 1. The room is heated by a two-inch welded steam coil, the total linear length of which is about 440 feet.

For more complete information concerning the plans and details of the construction and arrangement of this barrel-drying room, the reader is referred to the drawing of same given in Fig. 1.

In conclusion it might again be emphasized that this barrel-drying room is so simple in its design, and fulfills the purpose for which it was built so successfully and economically (that it, from the standpoint of efficiency, especially since less labor for handling the barrels is required, while steam costs are no greater than when a special air heater is used) that the same design can be followed—if necessary on either a smaller or larger scale—by any refiner or marketer who finds it a necessary part of his business to recondition used barrels.

Five Rungs on the Progress Ladder

By OTTO PETERS
General Superintendent Hanlan Gasoline Company

Here is another of Otto Peters' messages to plant men. He has been up the ladder himself. Perhaps he would prefer it stated that he is still moving up the ladder.

Anyway he has a few words for those trying to make headway, while earning a living at making natural gasoline.

Those expecting to learn how the climb is made without knowledge, study or effort need not read further.

The Editor.

IN the operation of a gasoline plant there are many opportunities for advancement to the man possessing initiative and the other qualities which make up a desirable employe. It is an established fact that many men are promoted from the ranks to the position of plant superintendent which is a position of responsibility and trust. It should be assumed with a determination to act as a counselor and guide in administering the policy of the management. The problems confronting the plant superintendent are without end. Present day practice calls for an absolute fundamental knowlege of gasoline properties, physics, chemistry, power plant practice and the art of plant erection and operation.

In assuming the responsibility of plant supervision we find one of the most immediate and perplexing problems to be that of labor, so that where a man has spent time and money to acquire knowledge of gasoline plant operation, the matter of handling men may have been overlooked, and the fact remains it is just as essential to understand the man as it is to understand the plant. Usually a plant is isolated with but a few families of the working force living there, so that the daily intimate contact between the superintendent and the men should be the means of bringing about complete understanding, mutual respect for departmental functioning, and perfect cooperation to obtain one hundred per cent efficiency. To attain this end makes it necessary to understand the men accepting your supervision and the accomplishment of it is the moral obligation you assumed in accepting the position of plant superintendent. It is necessary to understand human nature in order to put the right man in the right place and the quickest way to learn it is to study oneself. It is only when we understand ourselves that we can judge the other man, and for a man to adjust his routine to develop a strong personnel in the plant this knowledge is needed. Of course it can only be acquired in time, much can be said about it and many methods adopted, and to apply it requires much tact, patience and perseverance.

The fundamentals of this study as read from time to time I have arranged in groups of three, thus making them easy for application and comprehension. They are submitted as a starting point for the man who is anxious to meet his obligations with a more broadened vision of his responsibility, as a matter of fact ones success is in direct proportion to his conception of his responsibilities which are both visible and invisible. Always remember that those acting in a supervisory capacity are held responsible for the impression created among the trades-people handling company business, the respect of the community in which they live, and the opinion which the men accepting their supervision have them. When in authority it's a question of whether you want to domineer or whether you want to lead, and your men soon find it out.

First.....	Man..	Mental Physical Spiritual
Second....	Labor..	Wages Working conditions. Living conditions
Third..	Executive..	Oragnize Deputize Supervize
Fourth.....	Work..	Safety Efficiency Economy Cleanliness
Fifth.....	Motto..	Early to bed Early to rise Work like hell And economize.

Regarding the first item—We favor the man with an active mind, in this business we need men who are quick in

Making Good the Guarantee

Williams Double-Disc Gate Valve No. 127—representing the height of valve service. Ask your dealer for it.

No effort to shirk responsibility! No grumbling over severity of the service demanded! No "ifs or ands" or quibbling of any nature!

Service at a profit! That is the plainly understood proposition on which all **Williams Valves** are sold. Discriminating valve buyers know the **Williams** saves coal, labor, time and trouble, and assures uninterrupted production. Profits from such service are incalculable.

Williams Double-Disc Gate Valve No. 127

is one of the peerless **Williams** line that is famed for abolishment of all waste—for the insurance of a full, steady and leakless flow of Air, Steam, Water, Gas or Oil.

A tight seat is assured by the ball and socket bearing discs that also compensate for any temperature distortion or sagging of pipe lines.

An **exclusive** Williams feature is the Union Ring method of securing the bonnet to the body, providing a rigid, steam-tight joint that cannot corrode.

The heaviest stem used in any gate valve—made of special hard bronze that will not bend or break. Acme Standard threads assure maximum wear and long life. Packing is forced against the stem by a Packing Gland Follower.

Many other features that explain the extremely satisfactory service of Williams Valves are described in our Catalogue 10. It clearly explains why Williams Double-Disc Gate Valve No. 127 always makes good.

Made in two patterns—Medium for 200 lbs. pressure and Extra Heavy for 300 lbs. pressure.. **Satisfaction Guaranteed.**

Catalogue No. 10 mailed on request.

Dealers Carry Williams Valves and Will Fill Your Order for a Sample Promptly.

The D. T. Williams Valve Company

Cincinnati, Ohio

Makers of High Grade Bronze and Iron, Regrinding and Nickel Seat Stop and Check Valves, Gate, Blowoff, Hydraulic, Swing and Ball Check, Needle, Hose, Whistle Valves, Stop and Air Cocks, Unions, Fittings, Water Gauges, Gauge Cocks, Oil Gauges, Lubricators, Oil and Grease Cups, Steam Traps, Separators.

Williams Valves

Mention Where You Saw the Advertisement

thought as well as action. Physically we need men in good health, there is no room for the chronic complainer. Spiritually we look to the man who observes the interests of his job and fellow men, he will not be late, he will not be absent, he will come clean in all things.

Regarding the second item—Wages are in the hands of the management and are not to be questioned, play fair and pay square. Working conditions are not only in hours of work but in kind of tools and their condition, also associations, maintain harmony and prevent cliques. Living conditions apply to the residences at plant, look after them from the viewpoint of morale and sanitary condition, provide reasonable comforts, and safety for the children, and above all things let there be no scandal.

The third, fourth and fifth items speak for themselves. I would rather you put your own interpretation to them, and as a word of assurance permit me to tell you that I have always found ready desire and a response to cooperate in their adoption by men working with me in a united effort for the benefit and the glory of the plant we operate and our gratification lays in the sharing of success.

A plant can not be operated with a set of hard and fast rules. Rules are needed to adopt and maintain discipline, also as words of caution, but when rules reach the point indicative of what not to do that the time to study the situation or the men. It's hard to expain why men become indifferent, why some drop out, why some do not advance, why some drop behind. This business of gasoline plant operation is very exacting, it keeps a man right on his toes all the time, and there are many discouragements, but the price of success is to keep everlastingly at it, never mind the handicaps just keep plugging. This business needs men with vision and courage, exercise your vision to see what's ahead of you, the work you do today—what does it mean to the plant, what will it mean in time to come, how long will it last?—It takes courage to say no, it takes courage to eliminate hazards, it takes courage to be strictly impartial, but as a last word let me ask you, what greater satisfaction can you have than to make good on a job that takes all you have and the best you have is not too good for it. That's what you owe the plant, that's what you owe to yourself, throw your hat in the ring and stay with it.

Bessemer Has Exhibit

The Bessemer Gas Engine Company is exhibiting a full line of Bessemer Diesel Engines at the Sesqui-Centennial Exposition at Philadelphia. The engines which are displayed are adapted for Oil Country, Industrial and Marine service of all types, and are set up and running so that they can be seen in actual operation. In this way, visitors to the exhibit can see their smooth, quiet, vibrationless operation, and can study their operation while they are performing.

The display consists of a 6-cylinder 220 h. p. Direct Reversible Marine Engine, a 60 h. p. 3 cylinder Diesel Direct Connected to 35 K. W. Generator, an 85 h. p. Diesel Direct Connected to 50 K. W. Generator, a 150 h. p. 4 cylinder stationary Diesel and a 110 h. p. 3-cylinder Marine Engine with Reverse Gear.

New Distributors For Botsfield

Philadelphia, Pa.—Nov. 5, Botfield Refractories Company, with headquarters in this city announce that the following firms have become distributors for Botfield products:

The Westwater Supply Company, 150 N. Third Street, Columbus, Ohio, will handle Adamant Fire Brick Cement.

In Dayton, Ohio, the Klinger-Dills Company, 129-131 N. Jefferson Street, has been appointed to handle the same product.

Coan Equipment Company, 235-2 2 Murray Street, Fort Wayne, Indiana, is the distributor for the Fort Wayne vicinity.

For the Cleveland district, the Cleveland Tool & Supply Company, 1427-1437 West Sixth Street, will handle and distribute the cement.

All four organizations will be glad to co-operate with fire brick users whenever possible.

Funk Goes With Newton Process

I. B. Funk, Consulting Engineer, 931 Title Insurance Building, Los Angeles, California, has associated himself with The Newton Process Manufacturing Company, of Fullerton, California. Mr. Funk has had a wide range of experience in the oil industry especially in the design and operation of natural gasoline plants. During the last five years practically all of his time has been devoted to research work on natural gas absorption and refinery distillation and fractionation. He has to his credit a number of improvements in

processes and apparatus. Mr. Funk will act in an advisory capacity to the Newton Process Manufacturing Company.

Mr. Funk has perfected a new fractionation still to be known as the Funk Combined Still, Fractionator and Condenser, and orders have been received for a number of these. This Combination Fractionation still is said to be a marked advance in the economical production of gasoline.

JENKINS CRACKING PROCESS

PRODUCES QUALITY GASOLINE

Facts from performance

27
Units

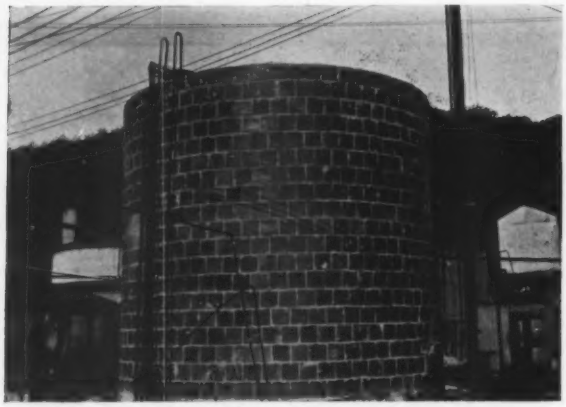
of the Jenkins Cracking Process are now operating or under construction in

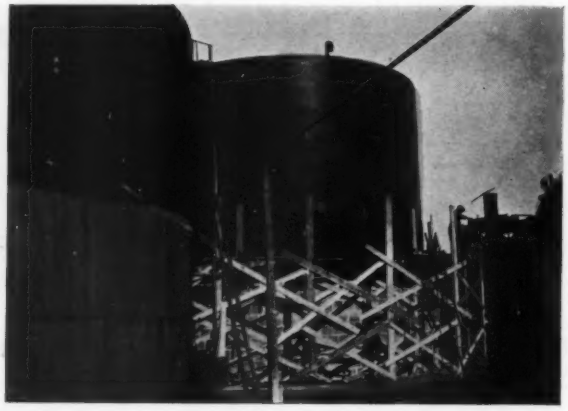
14
Refineries

——an increase, in less than two years, from three Units in one Refinery.

GRAVER *Founded 1857* *Corporation*
EAST CHICAGO, INDIANA

NEW YORK Grand Cent. Term. | CHICAGO Steger Building | TULSA Atlas Life Bldg. | HOUSTON West Building





At the left is a tank of the Kendall Refining Company, Bradford, with covering of hollow tile. A fireproof roof is yet to be put in place. At the right is shown the method used by the company in covering tanks with tile.

Tile Wall Protects Refinery Tanks

By ROYE C. MUNSELL

A NEW solution to the problem of protecting and insulating storage tanks at a refinery is to build a wall of hollow tile around them.

As far as the present writer knows, the first time such thing has been attempted was at the plant of the Kendall Refining Co., at Bradford, Pa.

According to Mr. H. H. Greene, of the Kendall Refining Company, it works most satisfactorily and will be used in the future where insulating and protection are needed. One tank has already been completed, except for the roof, and another one started.

The tile used by the Kendall Refining Company is not of a special kind. Ordinary hollow tile commonly used for building farm silos and other similar structures was employed. Each piece covers a square foot of surface and is slightly convex to conform to the curvature of the tanks.

The first step in covering a tank with the hollow tile is to lay a concrete foundation to support the tile. Before the tile is put into place, however, the tank is given a thorough coat of good paint. The paint job must be the best possible, of course, because after the tile is once in place repainting is impossible.

Air Space Left

The tile is not laid right against the tank walls, but an air space of about two inches is left between the inside surface of the tile and the wall of the tank.

This air space between the tile and the tank, and the air spaces provided by the tile blocks themselves, make insulation against heat well nigh perfect, due to the insulating qualities of the air.

The tiles are joined perfectly with cement. Since each one covers approximately a square foot of surface the time required to lay them is very short.

The Kendall Refining Company will put a Johns-Manville fireproof roof on these tile covered tanks. Steel rods are run at intervals up through the tile walls both as a way to fasten on the roof and as a means of reinforcement.

The Kendall Refining Company under the direction of Otto Koch, the president, and his associates is one of the most efficiently operated and progressive independent refiners in the East. They are now carrying out a rather extensive program for enlargement and further improvement of the Bradford refinery.

Forced Draft for Tower

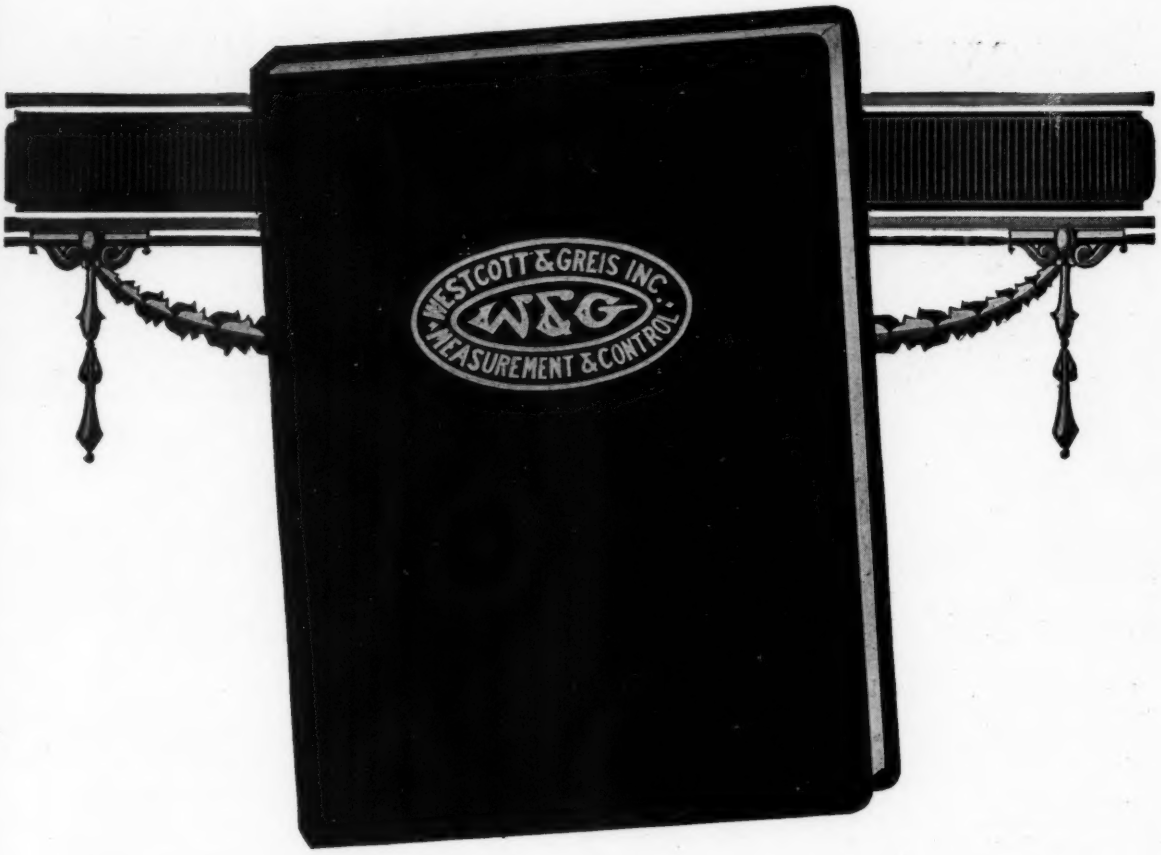
One of the recent additions to the plant to add to its efficiency is an improved cooling tower with a forced draft built by the Wheeler Construction and Engineering Company.

The tower is 75 feet high and divided into two separate cells. Each cell has two fans, one on each side, making a total of four for the entire tower. Two 30 horsepower electric motors are used to drive the fans.

The forced draft provided by the fans make it possible to reach relatively low temperatures with the water being cooled and maintain a fairly precise control under all weather conditions.

During cool weather the fans on one cell may be shut down, and during extremely cold weather the forced draft of both cells may be stopped entirely and the tower run on natural draft. Natural draft is secured by opening transoms placed near the bottom of the tower. The extreme height of the tower greatly facilitates natural draft.

At the left is a water cooling tower with forced draft at the Bradford plant of the Kendall Refining Company. Note the height of the tower. At the right is a bottom view of the cocling tower showing transoms for securing draft during cold weather and large fans for forced draft..



A Westcott & Greis CATALOG

Three pages, taken from the new Westcott & Greis catalog are shown herewith to give an idea of the wide range of subjects and products treated in this latest measurement and control and conservation and safety catalcg. Write for your copy.

We take pleasure in announcing a new and comprehensive catalog dealing with measurement and control, and conservation and safety devices and methods.

Purchasing agents and Oil Industry engineers may now have for the asking the most complete catalog in history on the above subjects. Over 12 months of research work are represented in the compilation of this catalog, the experience of 25 years of actual engineering practice in the Oil and Gas fields.

Fill in your name and address across the bottom of this page and mail to us—you'll get your copy of this new catalog by return mail.

WESTCOTT & GREIS, INC.
TULSA
Dallas Los Angeles

NAME..... ADDRESS..... COMPANY.....

Mention Where You Saw the Advertisement

Recovering Inorganic Decolorizing Powders

By ISMAR GINSBERG

THE use of mineral decolorizing agents in the refining of petroleum and petroleum products is assuming increasingly great importance as the various details of the use and the recovery of these substances are better worked out. Their introduction into the chemical field has been of material advantage in many chemical processes and perhaps nowhere so marked as in the oil industry. The oil man has had a difficult problem to solve in the decolorization and deodorization of the raw product that he employs in his manufacturing methods as well as the products that he obtained from them. The use of mineral substances which have the power to remove these impurities has done much to lighten this burden.

However, one of the most important considerations connected with the use of these decolorizing and deodorizing agents has been their recovery after use. This has been a necessary requirement in their use, for after they have once performed their action, they are still usable if they are properly freed of the impurities that they have absorbed and reactivated. Hence the various processes which have been used for this purpose are of particular interest to the oil man, and this article deals particularly with the more important of the methods of recovering and reactivating mineral decolorizing powders as gleaned from the voluminous patent literature on this subject.

As far back as 1890 a patent was taken out in England (British Patent No. 7142) on the use of silicic acid, obtained in the chemically pure state by precipitation and ignition, for the decolorization of mineral oils. The oil is stirred up with the mineral decolorizing agent and then filtered through a kieselguhr filter. The coloring matter which contaminates the silic acid can then be removed by extraction with benzol or carbon disulphide and the purified powder can be used over again in the process.

Foreign Patents

German Patent No. 106,119, which is dated Nov. 28, 1898, covers a process for the removal and the recovery of oil, mineral oil, paraffine and the like, from decolorizing media, or bleaching earths, which connotes that the latter are simultaneously reactivated. The process consists in the treatment of the residues with water or steam under pressure and at high temperatures. It must be remembered that in considering the question of the recovery and the revivification of the bleaching earths and decolorizing agents it is not only important to bring the reagent back again into condition to be re-used, but the recovery and refining process must be carried for a still more important reason which involves the oil or fat content of the decolorant. It is a fact that the decolorizing process cannot be carried out without there remaining at times upwards of forty per cent of the oil in the residual mass, and it stands to reason that it would not be economically possible to throw this mass away. This condition applies to such reagents as alumina, aluminum magnesium hydrosilicate, fullers earth and the like. This was in the past a serious difficulty in the application of these materials to the refining of petroleum oils.

Attempts have been made to remove the oil from the used decolorizing powder by flotation in water, but this method does not allow a sharp separation between the oil and the powder. Simple treatment with hot water has also proven unsuccessful, but when pressure and high temperature are employed as above good results are obtained. In this process the oil is made to float on the water and the decolorizing powder is cleanly separated from the oil.

Steam Process

An interesting process in which steam is also employed is described in British Patent No. 10,825 of 1901. In this process the material is subjected to the action of steam in a closed vessel, the latter being completely filled with the residual decolorant. The closed vessel is externally heated while steam is being passed through the interio. This is continued until the injurious organic and sulphur compounds are decomposed and then the external heating is discontinued and the steam is allowed to pass through the apparatus until the decolorant has attained the temperature of 100 degrees C. Various types of fuller's earths can be successfully treated in this manner. The process regenerates the decolorant and its normal hydrated condition is re-established. If the material in the lump or powder form contains little or no hygroscopic water, in addition to the water of hydration, then it is necessary to have steam enter the vessel and pass through the material saturating it with moisture. As a general rule it will be found that the steam at the exit point is hotter than at the entrance port, and hence irregular heating ensues. In order to avoid this it is necessary to employ superheated steam.

Another interesting patent is German Patent No. 230,250 (the process is also patented in United States Patent No. 913,500, Austrian Patent No. 43,-927 and Belgian Patent No. 208,394). This patent covers a process for the extraction and the regeneration of used bleaching earths by means of a volatile solvent, the operation being carried out in the same apparatus in which the bleaching of the oil was effected. The bleaching earth which is held in a layer between two vertical filtering surfaces is kept in constant agitation and suspension by means of a current of the solvent. Complete removal of the oil is obtained only after indirect heating of the thoroughly extracted material, but heating to incandescence is not necessary to bring about perfect regeneration.

Difficulties

One of the difficulties that is always encountered in the treatment of the used bleaching earths and the like with the aid of solvents is that channels and free passages are formed through the mass of material with the result that it cannot be uniformly and completely extracted. Such extracted earths are not suitable for re-use, for they will possess the required bleaching and deodorizing properties only in a certain portion. Various methods have been devised to get around this difficulty, one which has given good results being the packing of the material into bags. Another method is to divide up the material into different compartments. Still another method is to keep the material in the state of motion during the treatment by means of suitable stirring apparatus. This however then requires passing the extract and the suspended material in it through a filter press in order to secure good separation of the two. Then the residual solvent in the extracted mass can be removed by simple heating. Finally the earth is dried and made ready for use.

The use of hot air in the treatment of used bleaching and deodorizing earths is patented in German patent No. 246,376. The earth is dried by the passage of hot air through the mass of material contained in a drum. Then the earth is ignited in a retort. This means that the dusting that is effected by the ordinary treatment of the earth is prevented by the fact that the drying and the ignition processes are effected on the one hand by means of a current of hot air and on the other hand by the vapors that are derived from the retorts and which contain considerable quantity of dust. Fur-

The Dubbs Cracking Process is the main "cure-all" for refinery ailments, especially "pernicious anaemia," otherwise known as lack of "financial vitamins"

Regardless of the oil you have to crack or the products you wish to produce, the Dubbs will give you the biggest financial results

The facts are yours when you want them We mean facts, not merely figures

Universal Oil Products Company
Owners of the Dubbs Process
310 South Michigan Ave
Chicago, Illinois

thermore the dust that is contained in the hot gasses that are emitted from the retorts and the drying chambers is collected by passing these gases through filters.

Electric Purification

Electrical purification of bleaching earths is described in United States Patent No. 1,012,104. The earth is mixed with water and then passed through settling tanks, where the impurities are allowed to settle out and fall to the bottom. Then the suspension goes to pans where it is subjected to electrical treatment. A current of 150 amperes and 110 volts is made to pass through this suspension, which is first made electrically conducting. This then results in the precipitation of the pure earth. The water that is mixed with this earth can then be removed by filter pressing, centrifuging or heating with steam.

Steam distillation under a vacuum or at the ordinary pressure is carried out on the de-oiled extraction mass according to British Patent No. 28,261, 1913. Another process, as well as an arrangement for the ignition of the used, finely-pulverized decolorizing agent, is patented in German Patent No. 297,345. This process was originally intended for the treatment of decolorizing material is subjected to conplied to all forms of inorganic decolorizing agents. The ordinary furnaces are suitable for the treatment of coarse materials rather than the finely divided bleaching earths. These are fed directly into the ignition cylinders without preliminary heating, and the steam which is developed from the moist decolorizing matreial is subjected to condensation. It is only when the regenerating mass does not contain sufficient moisture of its own that additional steam is fed to it.

Then again the ignition process is divided into two parts. In the first stage the heavier portion of the material, which is not carried along by the evolved gases and vapors, is mechanically removed from the apparatus and is collected in a collecting chamber. On the other hand the remainder of the material which is carried along by the vapors is collected in another collecting chamber. Hence the apparatus which is employed for ignition of the earth consists of two parts. The first part is the ordinary ignition device and this is provided with a mechanical conveyor for removing the material from the apparatus. Then there is a second part of the apparatus which is directly connected to this first part and which acts as a sort of condensing device. This acts on the gases and vapors that pass through the apparatus and that are made to yield their content of decolorizing agent held in mechanical suspension.

In United States Patent No. 1,112,650 there is described a process for the regeneration of used decolorizing media in which a solvent is used just for the removal of coloring matter. Thus the material is first treated with an oil solvent, and then with a solvent that will dissolve the coloring matters contained in the spent earth. This latter solvent must remove the color only and not touch the oil. Both solvents are then collected separately and the material dissolved in them is removed and the regenerated solvent recovered.

Another United States patent (No. 1,132,054) describes a process for the treatment of fuller's earth which consists in extraction with a solvent, calcination and then decomposition with acid which has the effect of removing those ingredients that have a tendency to melt.

Austrian Patent No.80,801 refers to a process for the removal of the paraffine from the residual matter obtained in the refining of the paraffine. The process consists in the use of an oil, which is free from paraffine or which contains only a small amount of paraffine for dissolving out the paraffine from the residual decolorizing earth. Thus an oil is employed which will form a paraffine oil by dissolving paraffine. As a general rule the extraction of the paraffine in the residual masses is carried out with the aid of benzine. It is understandable that the use of this solvent involves great fire hazards and in addition to this the process has the disadvantage of entailing considerable consumption of steam in the recovery of the benzine. The process is also a slow one because of the difficulty with which parraffine dissolves in benzine.

In French Patent No. 537,499 a process is described for the regeneration of bleaching earths which are employed in the bleaching of mineral oils. This process consists in the treatment of the waste earth, after the oils have been removed from it by one or another of the common methods, with a tar oil base, such as pyridine. The purpose of this after-treatment is to remove the bituminous ingredient in the earth.

Fuller's earth which has been employed in the refining of petroleum and petroleum products is regenerated according to United States Patent No. 1,356,631 by agitation with a solution of a sulphonated soap.. This soap has the effect of removing the oil which has been absorbed by the decolorizing agent and also the impruities that are ordinarily found in it. After the first agitation, the process is repeated and then the earth is washed and dried. It is also possible to treat the fullers' earth with superheated steam and other agents which supplement the aforegoing action. The process can also be applied to the treatment and regeneration of animal charcoal, decolorizing carbon, wood charcoal and bauxite.

A simple process described in United States Patent No. 1,402,112 is to oxidize the earth and then partially roasting in a current of air at a temperature of 370 to 730 degrees C.

Results of Retorting Wyoming Bituminous Coal

THE fact that new sources of hydrocarbon oils, other than those now found in crude petroleum, are constantly being sought should make the following report interesting, among others, to refiners of petroleum.

At some time in the future, with the exhaustion of present petroleum reserves in this country, the industry undoubtedly will turn to the obtaining of oil from the oil-bearing shales of Colorado, Utah, Nevada, Wyoming and other Western States. Whether or not the retorting of low grade bituminous coal in a manner similar to the retorting of shale will have any economic influence on the source of our oils of the future is a question concerning which one could not at this time do more than to hazard a guess.

This present article will summarize the results of a retorting test made at the oil shale plant of the Trumble Coal and Shale Oil Company, Alhambra, California, on bituminous coal obtained from coal mines near Rock Springs, Wyoming. This work was conducted by the above-mentioned Company for the Union Pacific Railroad System, main headquarters of which are located at Omaha, Nebraska. E. C. Hoag is Chief Industrial Agent of the Union Pacific System and is the person who is responsible, to a great extent, for having these retorting tests made.

It is not the purpose of the writer to discuss in this article the construction of the shale oil plant in which these tests were made nor the details of the operating process, but instead merely giving a summary of the operating temperatures and pressures used and the yields obtained of different hydrocarbon fractions. The plant itself has already been described in different trade papers during the past year or more.

Results of Test

The duration of the test was about

SUNOCO

Each oil

is especially manufactured to meet a specific need—

Sunoco Absorption Oils 630 and 670

670 Oil is manufactured and especially recommended for straight steam still distillation. The initial boiling point of this oil insures easier fractionation and is especially beneficial in plants which are overloaded, together with its short boiling range of 160 degrees gives it a better capacity for gasoline.

Better fractionation
Greater heat transfer
Increased yields

630 Oil is manufactured and especially recommended for fire stills or combination fire and steam still distillation where a lower initial oil is more advantageous.

We will be glad upon request to furnish further information as to the merits of these two oils, together with samples and quotations.

SUN COMPANY

Petroleum Bldg., Tulsa, Oklahoma

Refineries at

Marcus Hook, Pa. Yale, Okla. Toledo, Ohio

two hours. Temperature and pressure reading were recorded at about ten minute intervals during the time that the test was being made.

Temperature Readings

Point at which reading was taken	Reading Number 1	2	3	4	5	6	7	8	9	10	11	12
	Temperature Degrees Fahrenheit.											
Bottom—Intake	1300	1400	1400	1420	1440	1460	1480	1460	1440	1460	1500	1520
Top—Outlet	300	375	400	425	475	600	685	745	790	820	885	925

Pressure Readings

Reading number	1	2	3	4	5	6	7	8	9	10	11	12
Pressure in lbs. square inch	50	60	60	65	65	55	55	65	60	60	65	55

All yields to be given following are based on the number of pound of each product obtained when a ton of the bituminous coal is retorted. The yield of gas is based on the number of cubic feet of gas obtained in retorting a ton of the coal.

Yields

The yield of gas amount to 10,152 cubic feet per ton of coal retorted.

A crude oil or tar yield of 200 pounds per ton was obtained. This crude oil consisted of the following:

	No. of lbs.	Nature of fraction
Water	30.0	
Fraction distilling between 110°-170° C	4.4	Light oils or crude naptha
Fraction distilling between 170°-235° C	24.8	Creosote Oil Fraction, or heavy oils.
Fraction distilling between 235°-270° C	17.7	
Fraction distilling between 270°-315° C	25.7	Anthracene Oils
Fraction distilling between 315°-355° C	63.9	
Residue	25.8	Pitch
Loss	7.7	
Total	200.0	

A so-called liquor yield of 195 pounds per ton was obtained. This amount of liquor contained 1.1 pounds of ammonium sulphate, the remainder of it being water.

A coal char or coke yield of 1130 pounds per ton was obtained.

Upon analysis this coke showed the following tests:

	Per cent.
Moisture	3.0
Ash	3.1
Volatile Combustible matter	10.2
Fixed carbon	83.7
Total	100.0
Sulphur, per cent	0.51
B. T. U.'S, per lb.	13,573

Or, on the basis of number of pounds of moisture, ash, volatile combustible matter and fixed carbon contained in the 1130 pounds of coke, the analysis showed the following:

	Pounds
Moisture	33.9
Ash	35.0
Volatile combustible matter	115.3
Fixed Carbon	945.8
Total	1130.0
Sulphur, pounds	5.8
B. T. U.'s (in 1130 lbs. of coke)	15,337,490

A final summary of the yield of the main different products obtained from retorting Wyoming bituminous coal is as follows:

	Yield in lbs. per ton of coal retorted.
Crude oil or tar	200
Liquor	196
Coal char or coke	1130
Uncondensable gases and loss	474
Total	2000

This article does not consider any of the economic phases involved in the retorting of bituminous coal, and, as a matter of fact, is more along the lines of a preliminary report as to whether or not there are any future possibilities whatsoever in so obtaining hydrocarbon oils from the vast quantities of low grade bituminous coal such as are to be found in Wyoming. Hence, the reader should consider the present subject matter, as a whole, as being presented primarily to cause additional thought and laboratory efforts on the part of others in making preparations for additional sources of hydrocarbon oils in the future.

Cracking Heavy Hydrocarbons

Continued from Page 38

oils was concerned with the use of a number of adsorption towers which were connected in series. Bayer activated charcoal was employed. Five towers were used, each one filled with 600 grams of activated carbon. The waste gases were found to burn with a luminescent flame. When the absorption towers were inserted in the installation, then the flame of the waste gas was colorless, indicating that the higher molecular weight luminescent hydrocarbons contained in the waste gases had been removed. It was found that the gases which finally escape from the end of the series of adsorption towers contain the difficultly adsorbed gases methane and hydrogen, together with some carbon monoxide and carbon dioxide.

In the original article various details are given on the manner in which the various gases in the waste gas were adsorbed in the different towers, indicating that the first tower in the series adsorbed the greatest portion of the gases, for the simple reason that it comes in contact with the highest concentration of these substances in the waste gases.

The important consideration in the adsorption of these vapors from the waste gas is the duration of the contact between the gases and the activated charcoal in the towers or in other words the length of the column of activated charcoal through which the gases pass. There is certain minimum beyond which it is not safe to go if complete adsorption is desired.

The results of the experiments that were made by Dr. Herbst in his investigations are given below. In the first place an illuminating oil residue of Polish origin and which contained no ingredient that boiled below 300 degrees C was heated to the boiling point in the presence of activated charcoal. The yield of light benzine was 9.4 per cent, the boiling point being between 50 to 150 degrees C, that of heavy benzine, boiling between 150 to 210 degrees C, was 9.7 percent and that of petroleum boiling between 150 and 300 degrees C 24.5 per cent. This therefore means a total of 43.6 per cent of newly formed products, figured on the weight of the original material.

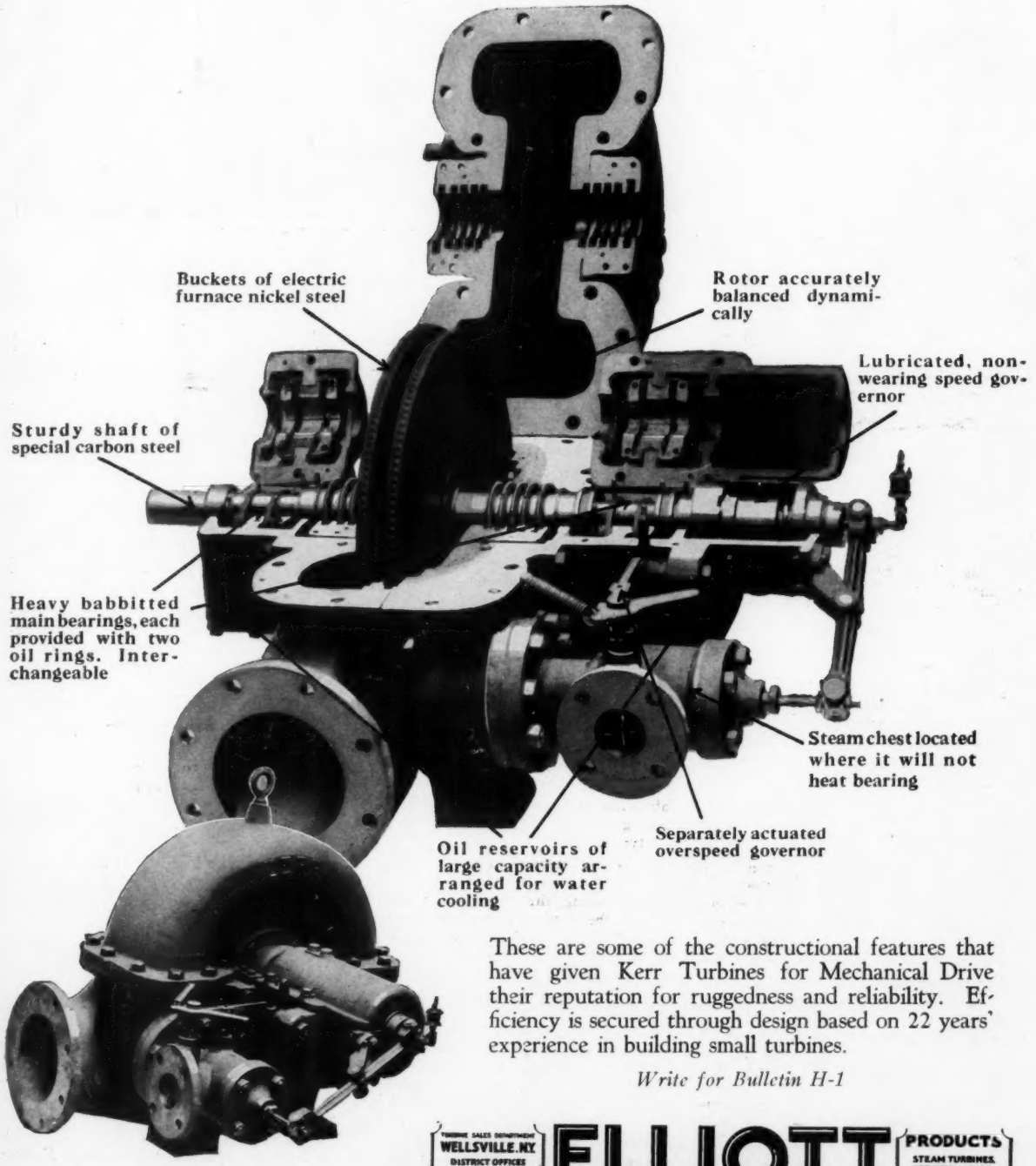
It was concluded that the splitting action of activated charcoal is a very powerful one, and is indeed more powerful than that of other basic, acid or metallic catalyzers. It has also been concluded that the good results that are obtained with the charcoal catalyst are due to the fact that this substance is a very active adsorbent, more so than any other material and furthermore that activated charcoal also possesses the power of forming labile adsorption compounds with the adsorbed substances.

Charcoal Use

Tests have been also shown that activated charcoal is very well suited for continuous cracking of hydrocarbons, for

Building Ruggedness and Reliability into KERR TURBINES

for Mechanical Drive


Buckets of electric furnace nickel steel
Rotor accurately balanced dynamically
Lubricated, non-wearing speed governor
Sturdy shaft of special carbon steel
Heavy babbitted main bearings, each provided with two oil rings. Interchangeable
Steam chest located where it will not heat bearing
Oil reservoirs of large capacity arranged for water cooling
Separately actuated overspeed governor

These are some of the constructional features that have given Kerr Turbines for Mechanical Drive their reputation for ruggedness and reliability. Efficiency is secured through design based on 22 years' experience in building small turbines.

Write for Bulletin H-1

TURBINE SALES DEPARTMENT
WELLSVILLE, N.Y.
DISTRICT OFFICES
ATLANTA, BALTIMORE, BOSTON, CHICAGO, CINCINNATI, DETROIT, CLEVELAND, NEW YORK, KANSAS CITY, ST. LOUIS, PHILADELPHIA AND PITTSBURGH

ELLIOTT COMPANY

PRODUCTS
STEAM TURBINES, REDUCTION GEARS, FEATHERS, HEATERS, CONDENSERS, AIR EJECTORS, AUTOMATIC & NON-RETURN VALVES, BLOW-OFF VALVES, GREASE EXTRACTORS, STRAINERS, SEPARATORS

Mention Where You Saw the Advertisement

the simple reason that prolonged use of the material does not appear to have any bad effect on its adsorptive capacity. Observation has also shown that the use of activated charcoal has the advantage over other catalysts and splitting media in that it does not lead to the formation of carbon deposits nor does it result in the re-formation of asphalt. Furthermore, it is not necessary to use a temperature approaching that of incandescence. By maintaining the correct temperature during the process and by preventing local overheating at various important points in the apparatus, it is possible to avoid the deposition of carbon, which frequently occurs in the cracking process and which is perhaps the greatest single difficulty in the process.

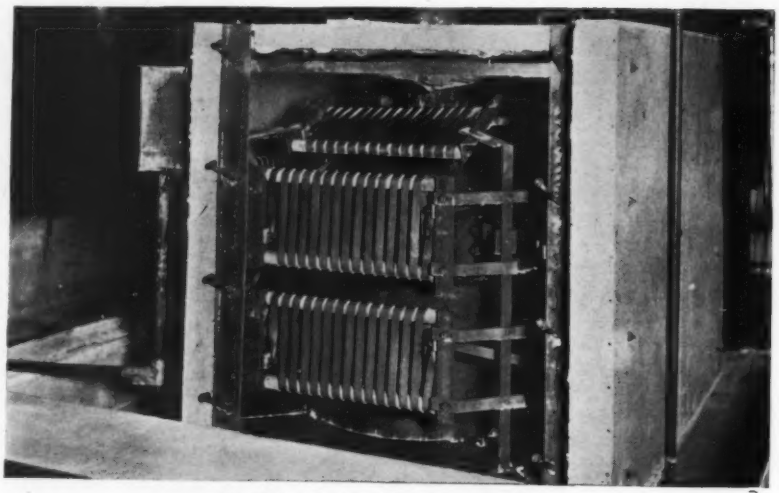
When the portion of the distillate, which is the gas oil and which boils above a temperature of 300 degrees C, is subjected to further cracking, then the yield of benzines is increased about 26.4 per cent. This percentage is composed of 2.49 per cent of light benzine (150 degrees C), 2.56 per cent of heavy benzine (from 150 to 210 degrees C), 6.47 per cent of petroleum (from 210 to 300 degrees C), 6.96 per cent of gas oil (over 300 degrees C), 6.63 per cent of asphaltic residues in the cracking vessel and 1.29 per cent of waste gases and lost materials. It is possible to obtain an additional ten per cent yield by cracking the residues still further. The final total amount of low boiling ingredients that are obtained by this process is 59.48 per cent.

In discussing the applicability of the process it was pointed out that it was well suited for the treatment of organic materials of different sorts, but especially mineral oils, high boiling mineral oil residuals, ozocerite, tars and the like.

The cracking temperature lies between 300 and 450 degrees C and the main cracking temperature between 350 and 410 degrees C, so that materials, which boil at temperatures within this range or higher, are decomposed without any trouble. When substances which have boiling points which are lower than 300 degrees C are to be cracked, then the opeartion must be carried out under high pressure, for these substances will not be cracked or only to a slight degree when heated under atmospheric pressure. When working under high pressures, considerable attention must be paid to the temperature to avoid overheating, for the formation of carbon deposits is much more possible under pressure than not, and carbon forms the more readily the higher the pressure.

New Pennsylvania Agency for Quigley Products

Allentown, Pa.—W. H. Taylor Company, of Allentown has been appointed distributor for Quigey Furnace Specialties Company, Inc., of New York, covering the Allentown territory for all Quigley products, including hytempite, acid-proof cement, Quigley refractory gun and triple-A protective solutions, etc., which will be carried in stock.



Electricity Used to Heat Grease Kettles

Electricity Used to Heat Grease Kettles

Engineers of the Union Oil Company have recently turned to electric heating units for securing and maintaining proper temperature on their grease kettles at the grease plant, Oleum, California, refinery. The particular grease plant in question at this refinery is located on the plant yard at quite a distance from the central power or steam plant, so far in fact, that much difficulty was experienced in securing the temparature of 350 degrees F. at the grease plant. Thus the staff was confronted with a local engineering problem which involved the conducting of steam to the grease plant with very little loss of temperature; the installation of a separate boiler close or adjacent to the grease plant, or the adaptation of electric heating units for the operation of the grease kettles. The solution of this problem, taking into consideration the important items of first cost and efficiency and economy resulted in the installation of the electric units. The success of this use of electric heating processing a by-product of California petroleums is considered as the opening of a comparatively new field for this type of heat.

The manufacture of greases usually follows about the same process as that used in soap boiling, the boiling or saponification of the fats taking place in steam-jacketed, or as in this instance electrically heated, kettles having stirrers mechanically driven by motor or belt drives. The load in the kettle as processed at the Oleum refinery consists of mineral oil, caustic soda and stearic acid mixed in proper proportions to make up approximately 150 gallons. The temperature is maintained at about 350 degrees Fahrenheit for a period of around eight hours, the load being agitated by means of motor-driven paddles or stirrers.

Fourteen 3.8-kilowatt General Electric heating units are arranged in three zones around the bottom of the kettle, four of which are used as external resistance which can be cut in or cut out as required to obtain any variation of heat to effect changes of temperature when necessary. Three control switches and a disconnecting switch are employed for controlling the heat. A watthour meter is installed which provides means for keeping a close check upon the amount of energy required to make a run. This auxiliary equipment is also General Electric. The insulation consists of two sheets of half-inch transite separated by approximately four inches of insulating powder.

One of the reasons why electric heat is attracting attention in this field, is because of the fact that new processes for grease making sometimes require relatively high heat temperatures of 350 degrees F., which makes it somewhat inconvenient to employ steam as heretofore used, with the result that steam for heat is being supplanted by electrical units designed especially for the work at hand.

Dan L. Newton, President of the Newton Process Manufacturing Company of Fullerton, California, with Mrs. Newton arrived home in Fullerton from South America on September 22, by way of New York.

The Newton Process Absorption Gasoline Equipment and Plants have enjoyed considerable sale in South America during the last twelve months, and the increased export business necessitated Mr. Newton's personal supervision of several installations of complete plants and additional units in plants requiring additional equipment to take care of increased production. Mr. Newton reports considerable activity in the oil and gas fields of South America and relates many interesting incidents of the trip.

Newton equipment is made at Fullerton, California, in their lately erected modern plant, and is distributed by Hurley Brothers of Tulsa, Oklahoma and the National Supply Company of Toledo, Ohio.

STOP PIPE CORROSION
IN SMALL LINES

Our Simplex Prepared Joint Cast Iron Pipe is made in 2″, 3″, 4″ or 6″ diameters. Since it has been available thousands and thousands of feet of this material has been used in the oil fields.

Illustration of section through assembled joint of Simplex Prepared Joint Five-Foot pipe, showing asbestos endless ring gasket in place. This gasket is adapted to use for oil, vapor and acid lines. A rubber gasket is compounded to suit the particular service it is to render—steam, natural gas, artificial gas, water, oil, etc.

Its chief advantage lies in its immunity from corrosion as compared with other ferrous pipe. Its desirability is further increased by the special joint, with only two bolts, and with a thick, endless ring gasket. It is rapidly and easily laid by inexperienced men.

Wherever permanent construction is desired, it is little short of an economic crime to spend money for a pipe line of perishable material when a practically permanent construction can be obtained by the use of cast iron.

Do you know why cast iron withstands corrosion so much better than any other ferrous metal? Our Bulletin No. 44 explains it.

Simplex Prepared Joint Pipe is furnished with full line of fittings. The material is fully described and illustrated in our Catalog No. 48. Your copy is waiting to be mailed, upon receipt of your request.

American Cast Iron Pipe Company

General Offices and Foundry: Birmingham, Ala.

Branches at
Dallas, Kansas City, San Francisco, Los Angeles, Chicago, New York, Minneapolis

Write Also for Information on Our Simplex Cast Iron Pipe for Oil Condensers

The Elimination of Waste in the Refining of Petroleum

(Continued from page 28.)

tubes agitating equipment by sulphuric acid.

Practically all of the oil lines in the industry are underground which causes much deterioration. It would be difficult to say which portion of the country experiences the most trouble as the west has an alkaline soil, the Mid-Continent a damp soil and the east a salty soil lowland. This problem has been practically solved by a treatment of the lines with an asphaltic paint or similar substitutes. The preparation does not eliminate interior corrosion nor electrolysis.

In condenser coils, supports and boxes, corrosion is brought about first, by water and secondly by hot still vapors. The cooling water entering in contact with the coils, supports and boxes deposit corrosion materials and scale forming ingredients which tends to pit the materials. The hot still vapors from some crude oil contain hydrochloric acid and sulphur compounds. These chemicals are very injurious to the coils but the corrosion actions may be retarded by a careful selection of materials, such as cast iron, commercially pure iron and brass, depending entirely upon the nature of the crude. In crude oil that contains salt water hydro-chloric acid is produced but may be neutralized by introducing ammonia into the vapor. Another method of removing the emulsified salt brine from the crude is to raise the temperature to 100 degrees F. or more and allowing the brine to settle before entering the stills for distillation.

In shell still the B. S. settles to the bottom of the still and under high temperature and excellerated oxidation is brought about through hot spots. Often times the still bottoms are weakened to such an extent that they become baggy. This is also eliminated by preheating the crude and allowing the B. S. to settle before entering the still. A proper selection of materials and the thickness will also prolong conditions.

Tube Still Advantage

The tube still has a marked advantage in this respect over the shell still. The oil in the tube is moving rapidly through the tube and the possibility of settling is not so great. The depositing of carbon on the tubes causes carborization resulting in brittleness. This is eliminated by radiant heat furnaces as radiant heat always tends to go through the coolest surface. The corrosion of shell pressure stills or tube stills is recognized as being the principal source of expense in refineries. With temperatures above 700 degrees F. the corrosion takes place very rapidly while it is practically negligible at 500 degrees F. The corrosion could be eliminated by the use of special materials but commercially it is not practical, so a commercial metal is selected with proper thickness to stand several years of corrosion deterioration before the danger point is reached. The tubes are also calorized to retard the reaction.

In agitators and chemical treater sulphuric acid and caustic soda are the principal offenders. The agitator tanks are lead lined steel while the pumps and the fittings are duriron, bronze and acid resisting alloys. Dilute acid washing are ordinarily handled in lead lined agitators having globe type roofs and these roofs are subjected to severe corrosion on account of acid vapors. In continuous treaters where gasoline and light oil distillate are handled the drums are made of forged welded tanks to stop corrosion around riveted joints.

The majority of the refineries use the Foamite fire extinguisher system to combat fires. As this system uses aluminum sulphate solution, corrosion must necessarily be heavy. This is reduced to a large extent by the use of wooden tanks or steel or brass tanks. The steel tanks are lead lined. All fittings used are brass, bronze and special acid resisting alloys.

Chemical Treatment

Many refinery products must be purified by chemical treatment. Formerly the unsaturated hydro-carbons in gasoline were removed but they are now considered by many of our best authoriies as among the most valuable constituents for motor use. This is particularly true of the unsaturated olefine group.

The batch agitator is now generally conceded to be markedly inferior to the continuous system of gasoline treatment. However, in treating kerosene it is not so apparent. The great advantage of the continuous system is the reduction of evaporation loss. In an agitator a loss of from one to two per cent from this source alone is often encountered, and this loss may be practically eliminated by using the closed continuous system. The continuous treater also used less chemicals for treatment.

General

In the large refineries where considerable electric power is used back pressure turbines have been installed, thereby obtaining power as a by-product. The tank pressure on the turbine is high enough so that the steam can be used in the stills. The turbine in effect is a reducer valve.

Sludge acid from the treatment of lubricating products, etc., are now treated and used for fuel in some form. Formerly this waste was dumped in a sludge pond.

New Canning Plant

The Gilmore Oil Company, Los Angeles, Cal., which recently purchased a little over one acre of land in the industrial district of Vernon, Cal., just across the street from its present refinery and headquarters site, plans to construct buildings for the housing of its 4,000-case canning plant, and for its garages, paint shops, etc. The company's canning plant is said to be one one of the most efficient in the district. Four thousand cases daily, 10 gallons to the case, are canned each eight hours of operation. This gasoline is marketed for the export trade and the company plans to enlarge this plant, probably doubling its capacity, in the near future.

Interesting Celite Bulletins Now Obtainable

"High Temperature Insulation" is the title of a bulletin being distributed by the Celite Products Company, 1320 S. Hope Street, Los Angeles, California.

The bulletin is a printed copy of a lecture on the subject which has been compiled by the Celite Products Company, and which is being used by the Mechanical Engineering departments of a number of the prominent universities throughout the country this year. This lecture goes into the subject of heat losses in general, methods of determining heat losses through walls and applications of high temperature insulating materials.

Bulletin No. 103, also a new publication, discusses Sil-O-Cel insulating brick, its construction, and numerous applications, all of which are of interest to refineries.

Bulletin No. 325, called "Celite—An Admixture for Concrete," gives directions for the use of Celite, with considerable technical data on the effect of siliceous admixtures in increasing the workability of concrete mixes and improving the uniformity and watertightness of the resulting concrete. A summary of tests made by many of the most prominent testing laboratories in the country, on the compressive strength of plain concrete and concrete in which Celite was used, is also given.

Copies of all three bulletins may be obtained from the Celite Products Company, 1320 South Hope Street, Los Angeles, California.

Reconditioning Plant

The Rio Grande Oil Company, of Los Angeles, Cal., has started reconditioning their 4,000-barrel refinery at Vinvale, Cal. Under the supervision of W. F. Pyne, Manager of Refineries, the entire system of distillation and fractionation will be altered and improved, which work embraces the replacing of the present fractionating equipment with the latest type of scientific automatic controlled dephlegmation equipment of the bubbling type. The installation will involve the changing of distillation methods and fractionation, changing the operation to that of a one heating procedure securing closer separation and fractionation. Five towers of the bubble type will be installed, one of which will produce a stream of gasoline from the heat interchanger opration. All products will be produced direct from the tower equipment in one application of heat. Completion of the proposed changes will make the lant one of the most efficient on the West Coast. Further proposed construction and expansion in the near futurce will includ the installation of a cracking unit and the enlargement of the chemical treating equipment.

ADAMANT
FIRE BRICK CEMENT
Reg. U. S. Pat. Off.

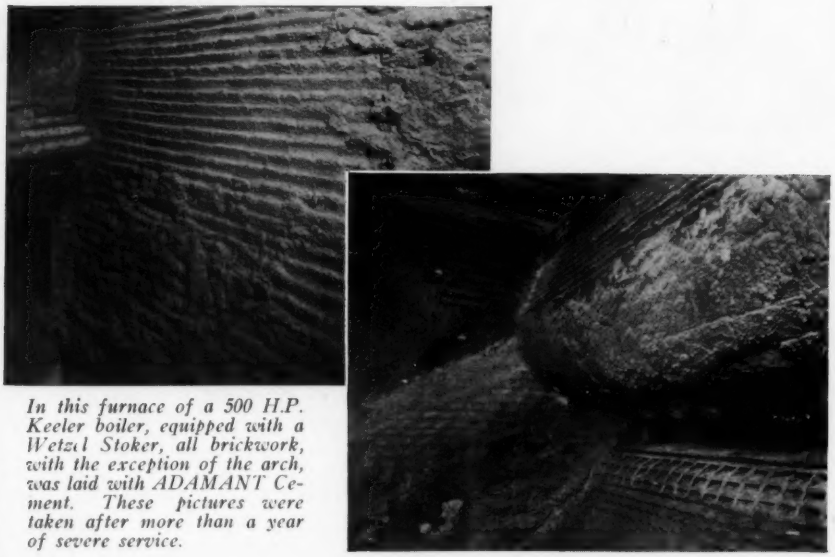
is carried in stock in 100lb., 250lb. and 400lb. air tight, metal containers by these distributors:

(Distributors listed under name of city. Write distributor in nearest city.)

Aspinwall, Pa.
The Gas Combustion Company
Baltimore, Md.
King's Coal and Supply Company, Inc.
Beaumont, Texas
Norvell-Wilder Hardware Company
Birmingham, Ala.
Young and Vann Supply Co.
Boston, Mass.
Waldo Bros. and Bond Company
Buffalo, N. Y.
Globe Plaster Company
Chicago, Ill.
Wm. E. Dee Company
Cincinnati, Ohio
The Wm. T. Johnston Co.
Cleveland, Ohio
H. W. Jarrett
Corpus Christi, Texas
San Antonio Machine & Supply Co.
Dallas, Texas
The Murray Company
Denver, Colo.
H.W. Thompson
Detroit, Mich.
H. D. Edwards & Co.
Duluth, Minn.
Duluth Builders Supply Co.
El Paso, Texas
Geo. S. Thomson Company
Erie, Pa.
O. C. Thayer and Son
Houston, Texas
Norvell-Wilder Hardware Company
Indianapolis, Ind.
Indianapolis Belting & Supply Co
Kansas City, Mo.
Union Material & Supply Co.
Los Angeles, Cal.
Industrial Supply Co.
Louisville, Ky.
E. D. Morton & Company, Inc.
Memphis, Tenn.
Reed and Duecker
Milwaukee, Wis.
Tews Lime & Cement Co.
Minneapolis, Minn.
Northern Machinery Company
Mohawk, N. Y.
The American Hard Wall Plaster Co.
New Britain, Conn.
Rackliffe Bros. Co., Inc.
New Haven, Conn.
The Warner-Miller Co.
New Orleans, La.
Woodward Wight & Company, Ltd.
New York City
C. C. Phillips, 110 W. 34th St.
Omaha, Neb.
American Machinery & Supply Co.
Pittsburgh, Pa.
The Gas Combustion Company
Post Office Box No. 1753
Portland, Ore.
The M. L. Kline Co.
Providence, R. I.
B. & H. Supply Company, Inc.
Reading, Pa.
Reading Foundry and Supply Co.
Rochester, N. Y.
American Clay & Cement Corp.
Wm. Summerhays & Son
Rome, N. Y.
The American Hard Wall Plaster Co.
St. Albans, West Va.
Edw. C. Kirk & Sons
St. Louis, Mo.
Reed Railway Supply Co.
San Antonio, Texas
San Antonio Machine & Supply Co.
San Francisco, Cal.
W. E. Mushet Co.
Seattle, Wash.
Cragin & Co.
Spokane, Wash.
Consolidated Supply Company
Springfield, Mass.
Oscar F. Carlson
Superior, Wis.
The Speakes Company
Syracuse, N. Y.
The Paragon Plaster Co.
Toledo, Ohio
The Toledo Builders Supply Co.
Tulsa, Okla.
Standard Asbestos & Cork Company
Utica, N. Y.
The American Hard Wall Plaster Co.
Waco, Texas
San Antonio Machine & Supply Co.
Worcester, Mass.
Waldo Bros. and Bond Company

Canadian Distributors

Hamilton, Ontario
Thomson-Gordon, Ltd.
Montreal, Quebec
Alex. Bremner, Ltd.
Port Arthur, Ontario
Wells & Emmerson
Toronto, Ontario
J. H. Morrison
Vancouver, B. C.
B. C. Equipment Company, Ltd.
Winnipeg, Manitoba
Walter Relves & Company Ltd.



In this furnace of a 500 H.P. Keeler boiler, equipped with a Wetzel Stoker, all brickwork, with the exception of the arch, was laid with ADAMANT Cement. These pictures were taken after more than a year of severe service.

Brickwork Life-
A Matter Of Your Own Selection

IF you lay up your fire brick with fire clay or with weak bonding-cements, you may "save" a few cents on the cost of bonding material. But — you are specifying a comparatively short life for your fire brick construction.

If you lay up your fire brick with ADAMANT (the ORIGINAL high temperature fire brick cement), bonding material cost may be fractionally higher, but your fire brick construction will have materially longer life—perhaps as much as 200% or 300%

In boiler furnaces and still settings in the refineries of a mid-continent company, brickwork life formerly averaged fifteen months. Since the brickwork has been laid up and "faced" with ADAMANT, the average life is 48 months—an increase of over 300%!

Think what this increased fire brick life would mean to you! Figure the savings in the reduction of fire brick purchases alone. Then fill in and mail us the coupon below.

Send The Coupon!

BOTFIELD REFRACTORIES CO.
783 S. Swanson St., Philadelphia, Pa.
New York Office: 5th Floor, 110 W. 34th St.

Botfield Refractories Co., 783 South Swanson St., Philadelphia, Pa.
We Want to try ADAMANT and see what brickwork savings we can effect.

Name and Title _____

Company _____

City and State _____

Whenever You Use A Fire Brick, Use

ADAMANT
FIRE BRICK CEMENT

The Original High Temperature Cement

Mention Where You Saw the Advertisement

How to Find the Heat Value of Fuel Oil

WITH the markets for petroleum products becoming, as the refiner states the case, more and more technical, many tests are rapidly becoming commonplace performance, which tests once were relegated to the hazy realm of scientific research. A few years ago it was known that "somewhere in a distant city" they could tell you the percentage of sulphur in a given oil or distillate, and very likely this same "they" could measure the quantity of heat in British thermal units, in any sample submitted. Now? In any refining center perhaps half of the local laboratories are equipped with both men and material that keep their copanies posted in regard to sulphur, B. T. U.'s and many other qualities merely as a matter of routine. Such is the progress of the industry.

Gasoline and kerosene have always been more or less subject to tests of precision and have been bought and sold on a basis of comparatively rigid specifications. The lower, heavier distillates, until recently have not required such full investigation of their physical and chemical properties. This market now is becoming more exacting in its requirements, as are all markets where products are sold on a basis of quality.

Fuel oil, for example, which formerly the refiner usually loaded and sealed without further ado, now requires the usual—gravity, flash and fire, B. S. and free carbon, cold or pour test—then viscosity and now—sulphur content and "quantity of heat" or B. T. U.'s.

Heat measurement is in fact becoming more and more important as an item in the selling of fuel oils and quantity of heat in residue oils will in all likelihood exert some influence in the purchase of crude petroleums in the future and no crude oil analysis will be complete without the report of B. T. U.'s per pound and per gallon of the residue or fuel oil stocks.

Units Defined

Quantity of heat is always measured by the amount of heat necessary to raise a certain weight of some body from one temperature to another temperature. For measuring this quantity there have been three units adopted which are known as the "British Thermal Unit," the "thermal unit" and the "calorie"—both great and small. The use of these units of heat measurement varies somewhat with the various industries, but the British Thermal Unit is extensively employed by the petroleum industry in both oil and gas work and natural gas along with fuel oils are marketed on a basis of heat quality or quantity measured and reported in British Thermal Units. For the sake of comparison some data relative each type of heat unit are given in this discussion as follows:

The definitions of al three heat units are given:

The "British Thermal Unit," commonly abbreviated to B. T. U., represents the amount of heat required to raise 1 pound of water 1 degree Fahrenheit.

The "thermal unit" represents the amount of heat required to raise 1 pound of water Centigrade.

To change B. T. U. into Thermal units —multiply the B. T. U. by five-ninths. To change thermal units to B. T. U. divide the number of thermal units by five-ninths.)

The "great calorie" (Cal.) indicates the amount of heat necessary to raise 1 kilogram of water 1 degree Centigrade.

The "small calorie" (cal.) represents the amount of heat necessary to raise one gram of water one degree Centegrade.

The measurement of heat, or the quantity of heat present in a given fuel oil is expressed as the calorific value of that oil. For the determination of the calorific value of oils, certain equipment has been perfected and is marketed usually as a "calorimeter."

The calorimeter serves for other purposes than heat measurement, but in the petroleum laboratory its work is usually confined to sulphur and B. T. U. determinations. The test for calorific value is more or less tedious in performance and unless the operative is given to precision and accuracy through experience and knowledge of his work, the bomb tests are often useless. Repeated explosions of the same oil by the same operative show varying results, and often it is the practice of the laboratory staff, to run several tests and report the average findings. This practice requires time, and in addition, the equipment is often more expensive than the refiner feels justified in purchasing for use in the average small plant laboratory. As an outgrowth of this condition of expensiveness and time consumed, along with the probable inaccuracy of the average test, has come the development of formulae for the approximate calculation of B. T. U.'s in any given oil. These formulae are based upon accurate, precision experiments, and for all practical purposes may be relied upon as authentic.

"Helios," Heine Boiler Co., p. 479, gives the formula of J. N. Le Conte, for approximate calculation of B. T. U.'s as follows: 17,680+(60 X deg. Be.)=B. T. U. per lb.

A certain large company operating in Texas uses the following formula for calculating heat value of North Texas oils—

18,500+ (40 x Be. Grav. minus 10)= B. T. U. per lb.

Example—29 gravity oil. 29 minus 10 leaves 19. 19 times 40 equals 760. 18,500 plus 760 equals 19260 B. T. U. per lb.

Marian E. Dice in Chem. & Met. Eng., p. 499 gives the following data regarding California oils. "The calorific value for California fuel oil varies about 40 B. T. U. per degree Be. or degree A. P. I., which leads to the following formula, determined by experiments: 18,165 + (40 x deg. Be.) B. T. U. per pound."

"The Dulong 1" (Gebhardt, "Power Plant Engineering") formula, which has long been in use for estimating the heat value of coal, gives a value about 5 per cent high for California should therefore be multiplied by .95: 14,544 C plus 62.028 (H minus 0/8) plus 4,050 S. The letters C H O and S denotes the weight of carbon, hydrogen, oxygen and sulphur per pound of fuel. Consider an oil containing 85.20 per cent carbon, 11.44 per cent hydrogen, 1.59 per cent oxygen, and 1.88 per cent sulphur and 0.443 per cent nitrogen by weight with a gravity of 19.6 degrees A. P. I. The calorific value by calorimeter is 18,949 B. T. U. per lb.

The LeConte formula gives, 18,950 B. T. U. per lb.

The California formula gives 18,949 B. T. U. per lb.

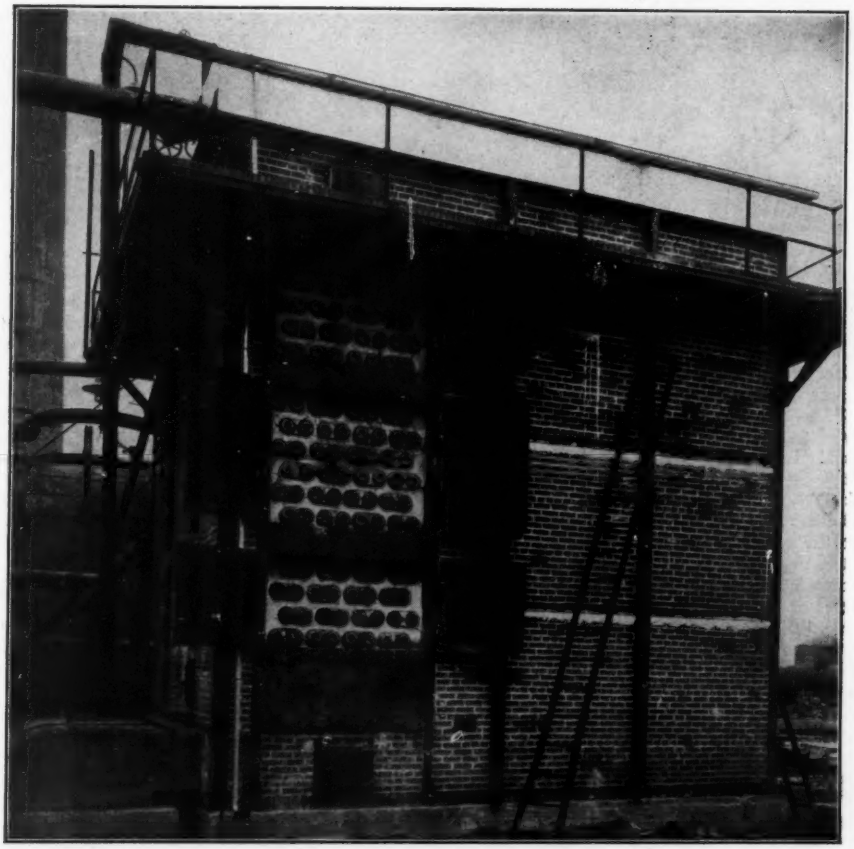
The Dulong formula, multiplied by 0.95 gives 18,855 B. T. U. per lb.

The fomula of company in Texas first gives 18,884 B. T. U. per lb.

While it is noted that there is a certain variation in results when all formulas given are employed with the same oil, it is, nevertheless, true that this variation is not of sufficient magnitude to be of importance for practical value or purposes, and neither is the variation much out of line with the usual results secured when the same oil is exploded in the calorimeter in repeated tests. Taking an average of the results obtained when the four formulae are used itis found that 18,882 B. T. U. per pound is the result.

FOSTER

TUBE STILLS



The result of over 20 years of experience in solving problems requiring use of heat.

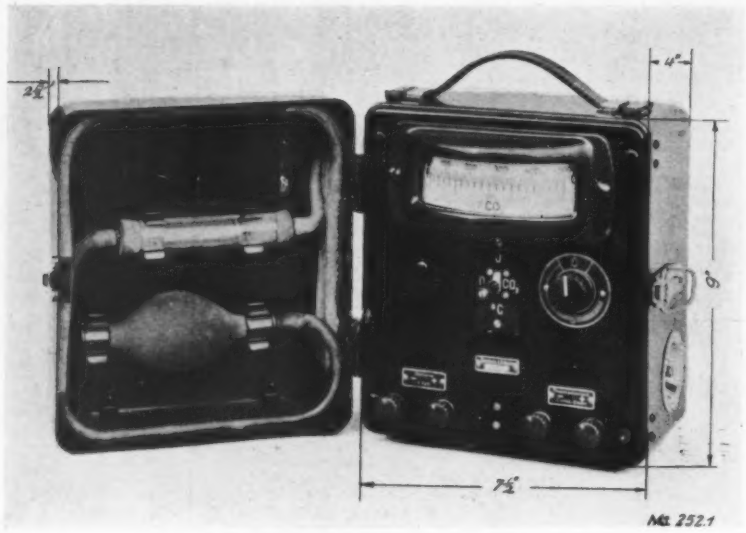
Foster Tube Still design prevents overheating by rapid and positive circulation, assures uniform heating by arranging all tubes to supply heat with practically equal effectiveness, secures minimum fuel consumption by gradual, continuous, thorough heating effect with complete combustion.

POWER SPECIALTY COMPANY

111 Broadway, New York

Branch Offices in All Oil Centers

RECENT ITEMS IN PLANT EQUIPMENT



Bacharach carbon dioxide meter

Improved Carbon Dioxide Meter is Out

A carbon dioxide meter that should prove valuable to combustion engineers, test departments, laboratories, etc., has lately been introduced to the trade by the Bacharach Industrial Instrument Company, 7000-6 Bennett Street, Homewood Station, Pittsburgh, Pennsylvania.

The instrument consists of a precision profile indicator at the top, below which is arranged from left to right, the bridge zero adjuster, a tumble switch and the variable resistance for current adjustment. To set the proper bridge current, the tumble switch is thrown into the upper position, this cuts the precision indicator into the circuit as an ammeter and the current is set to the top mark deflection by means of the variable resistor. Three standard dry cells are used as the current source and connected to the two binding posts in the lower left hand corner. When making temperature measurements, the tumble switch is thrown into the downward position, any standard thermocouple can be connected to the lower right hand terminals and the reading made on the millivolt scale. By means of a millivolt-temperature curve the temperature is determined.

For the analysis of flue gas the tumble switch is thrown into the center position. The gas is sampled by means of a hand aspirator which draws the gas through a small calcium chloride and cotton filter, which when not in use is conveniently held in the cover of the instrument as shown. The instrument is guaranteed to have an accuracy of one-half of one per cent CO_2.

The instrument can also be arranged to give continuous indications for short periods (2 to 3 hours.)

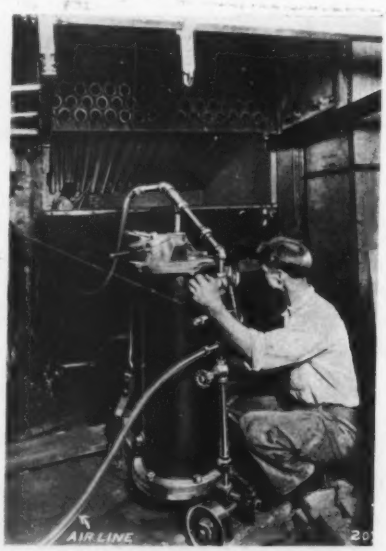
More information will be sent by the company upon application.

Refractory Gun for Use in Tight Places

A new use for their refractory gun is reported by the Quigley Furnace Specialties Company, 26 Cortlandt Street, New York.

A large baking company in New York found it necessary to repair leaky baffles. Efforts to seal the leaks by hand methods failed and the Quigley gun was tried with exceptional success. The baffles were "gunned" with a plastic refractory mixture.

The power plant superintendent for this company reported the incident as follows: "We first repaired the front baffle on one of the 400 horsepower units, using a mixture of crushed old fire brick and Hytempite. With a three-fourths-inch nozzle, four feet long, we reached up between the tubes in the first pass and applied the mixture first in one diagonal direction and then in the other. By this method we reached the entire front surface of the baffle. A slight turn of the nozzle right or left while shooting the mixture completely sealed the cracks and spaces around each tube.



Using the Quigley Refractory Gun to mend boiler baffles

"We also 'gunned' the bride wall, which had an irregular crack, two inches wide down through the middle of it. This work was started four hours after the fire was drawn and all repairs to bridge wall and baffle were completed in about two and one-half hours.

"In the adjoining 400 horsepower unit, the lower part of the front tile baffle had just been rebuilt and a new stoker installed. We decided to 'gun' this entire baffle and applied the plastic mixture over the new tile as well as the old part. To reach this surface, the plastic material was shot through 40 feet of hose to the nozzle.

"We also repaired the rear baffle in the same boiler to save rebuilding. It was close quarters to work in, as the space between the top row of tubes and the drum is only about two and one-half feet. We used 60 feet of hose with a four-foot nozzle and repaired this baffle from above, bringing the hose around the boiler and through the upper clean-out door."

Information about the Quigley Refractory Gun may be secured from the Quigley Company.

New Feed Water Regulator of Simple Design

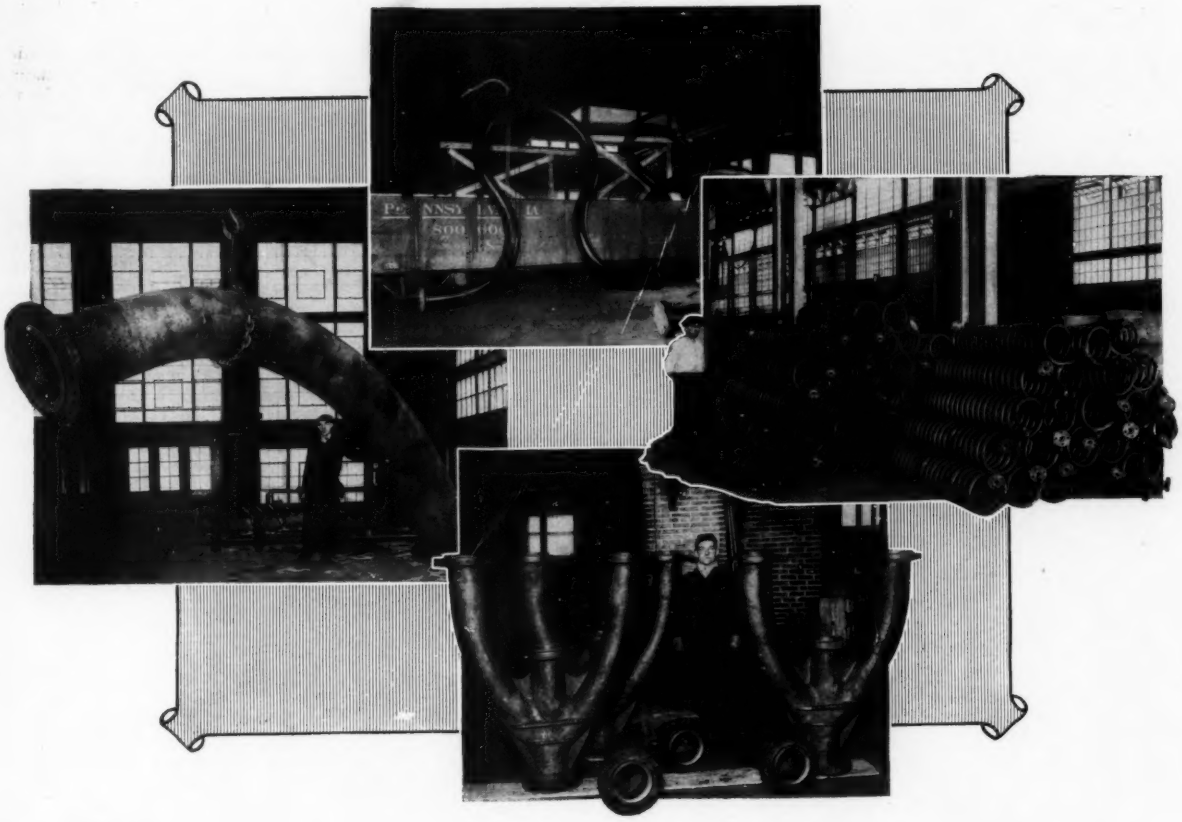
The Campbell boiler feed water regulator, being marketed by George B. Allan and Company, Simpson Building, Dallas, Texas, is said to be characterized by simplicity in construction and efficiency in operation.

The control valve can be placed in the feed-water line in any position or anywhere between the pump and boiler. If operating only one boiler, it can be placed on the steam line to the pump.

The regulator maintains a constant water level when the load is steady. It slows down the feed when there is a sudden increase in load, thus giving the boiler a chance to overtake the load before the regulator feeds more water.

There is nothing to get out of order about the regulator and no mechanisms requiring close adjustment. Operation is visible. The regulator may be attached to any water column through the top, at the side, through the try cock connection or any place on the boiler at the water line.

Further information may be had from George B. Allan and Company, Simpson Building, Dallas, Texas.



So many refiners -

WHEN they need fabricated piping, they naturally think of Midwest Piping Service—whether their requirements are a complete refinery piping system or only a few bends, coils and welded headers.

They have learned by actual experience that Midwest stands squarely behind every contract—that Midwest shop facilities and organization assure accurate and intelligent pipe fabrication in accordance with best modern practices—that Midwest is qualified and willing to help solve any piping problem—that the large and complete stocks of pipe, flanges and fittings, maintained in the Midwest warehouses, assure prompt shipment.

You also will find it to your advantage to use Midwest Piping whenever you require fabricated piping.

Write for circular 0-3.

MIDWEST PIPING & SUPPLY COMPANY

Second and Miller Sts.

SAINT LOUIS, MISSOURI

Tulsa Office: 805 Mayo Building **Chicago Office: 208 South La Salle St.**

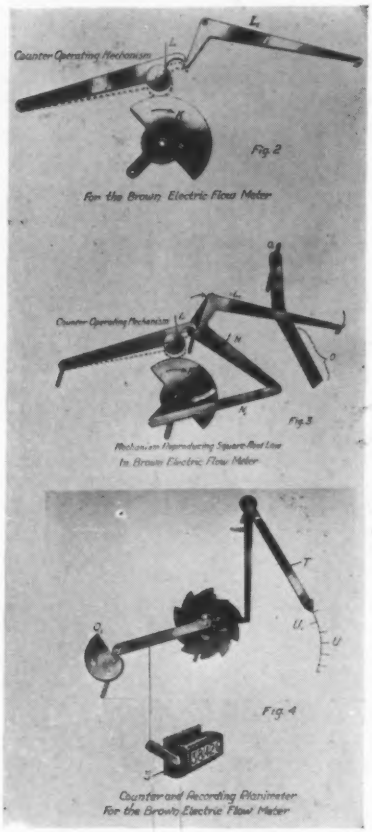
Fabricators of Oil Refinery, Natural Gasoline Plant and Power Piping

MIDWEST Piping and Coils

Mention Where You Saw the Advertisement

New Brown Electrically Operated Flow Meter Has a Number of Notable Features

In the new Brown electrically operated flow meter, manufactured by The Brown Instrument Company, Philadelphia, Pennsylvania, a number of notable features have been incorporated:



Readings of the instrument are fundamentally independent of the value of the voltage impressed upon the electrical system. The instrument is said to read correctly while operating on varying line voltages without the use of either voltage regulators or compensators.

The electrical circuits at the manometer, indicator and recorder consist of stationary, divided, inductance coils. These have only three connections which are permanently made at the time of installation. There are make-and-break contacts such as contacts dipping into mercury within the pressure chamber, voltage regulator contacts or similar devices.

In the manometer, or meter body, all electrical windings and connections are entirely external to the pressure chamber.

The integrater is a mechanical device operated by the electric clock which drives the charts. An equal amount of power is available for operating the integrator at all rates of flow, making possible the use of the most easily-read type of five-figure counter for the integrator.

A pen operated by the action of the integrator mechanism makes a record at the outer edge of the chart each time the integrator mechanism increases the counter reading by one unit. Each tenth mark is distinguishable from the intermediate marks in order to facilitate counting when it is desirable to determine the total flow for a day, or during any hours of the day, without having to watch the counter.

The entire integrator mechanism with its individual recording pen can be mounted in the standard recorder case along with the recording mechanism, thus avoiding the necessity of a separate integrator case.

As shown in the drawing, the manometer A operates in response to differential pressure caused by flow of the fluid through an orifice B. When the rate of flow increases, mercury is depressed in chamber A-1 and rises in chamber A-2, the difference in mercury level in the two chambers being a measure of the rate of fluid flow through the orifice in accordance with well known principles. When the flow increases from zero to a maximum value, a float which rides on the mercury surface in chamber A-1 is lowered from the position indicated by dotted lines to a lower position as indicated by solid lines. An armature C of transformer iron is supported by the float on a non-magnetic rod D and the armature is raised and lowered in accordance with the motion of the float.

This armature travels inside a rustproof, non-magnetic tube which has high electrical resistance and a great mechanical strength. The pressure of the fluid being metered is confined within this tube and the electrical inductive winding EE-1 which is slipped over the outside of the tube has magnetic linkage with the armature which moves inside. At the same time the coil is under atmospheric conditions only and is protected by a cover, F.

The outer ends of the divided winding EE-1 are connected directly across the service mains of an alternating current supply line and connections are run from these ends directly to the outer edge of a similar divided inductance coil FF-1 which operates an indicator H and also to divided inductance coil GG-1 operating a recording instrument 1. Armatures are hung on counterbalanced arms J and K in the two instruments. The points of connection between the two parts of divided coils EE-1 and EF-1, and GG-1 are all connected together by a neutral wire P and when thus connected the coils form the self adjusting inductance bridge which is the outstanding basic feature of the flow meter.

When the armature in the manometer is raised or lowered by a change in fluid flow, the relation between the voltage across the two parts E and E-1 of the winding will be changed. This causes the currents in the two parts EF-1 of the indicator coil, and also currents in the two parts GG-1 of the recorder coil, to become unequal, as a result the armatures of the indicator and recorder move to new positions corresponding to the position of the armature C and the meter reading are adjusted accordingly by means of the gearing or linkage shown.

In order to make use of the simple inductance bridge of operation, a special type of integrator was developed which

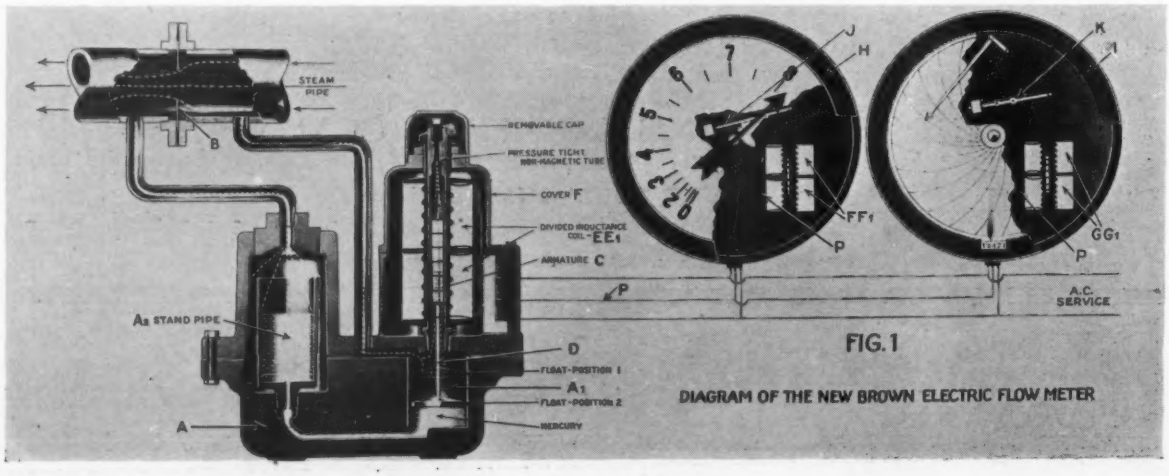


FIG. 1

DIAGRAM OF THE NEW BROWN ELECTRIC FLOW METER

Decreases 'Up-Keep' Costs

When the drilling engine is started up after a shut-down, there might be a water hammer or knock, which often results in broken cylinder heads, unless you have provided in some way for the condensation from the steam lines.

The FISHER Steam Trap No. 33, when hooked into a steam line, to a drilling engine in the field, decreases up-keep costs and increases the efficiency of the engines by providing dry steam at all times. A great many of these FISHER Steam Traps are in use in the oil fields and are giving gratifying results everywhere.

To facilitate matters for the operator these steam traps are now crated in a novel manner which allows connections to be made and the trap put into service without uncrating, thereby affording 100% protection to the trap under all conditions.

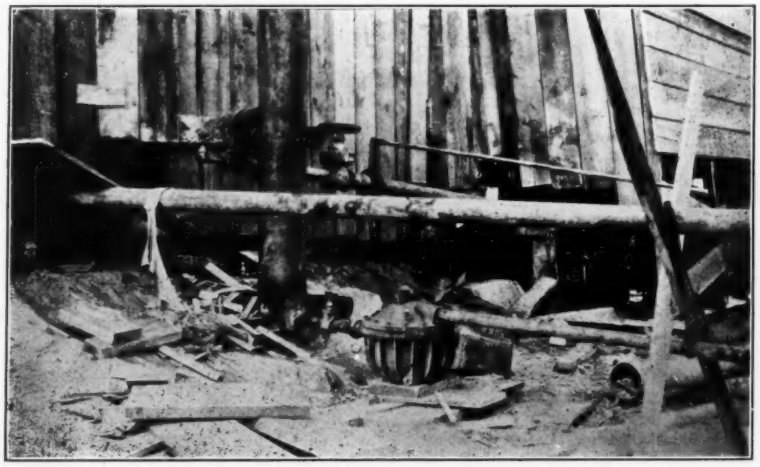
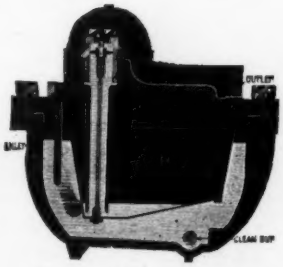


Illustration shows a Fisher Steam Trap hooked into a steam line to a drilling engine in the field. The efficiency of the engine is increased as dry steam is assured through use of the trap.

The Fisher Governor Co.

1307 Fisher Building

MARSHALLTOWN, IOWA



Fisher traps are strong, simple and positive acting. A main feature being, they have only two parts susceptible to wear, the valve and the seat. These can be changed without dismantling trap or disturbing pipe connections.

increases the counter readings in proportion to the square root of the angular deflection of the recorder pen arm, this being the relation of flow to the pressure difference across the orifice. Attached to the gear train which drives the recorder chart is a sector of a disc K (Fig. 2) which rotates at a constant rate. A roller L is normally held up by latch L-1, out of contact with the sector. The latch is tripped when the sector is in different positions, depending upon the rate of flow, and the roller is rotated through an angle proportional to the rate of flow before the sector passes out of contact with it. After the sector passes beyond the roller the latter is again latched up by L-1 and the process repeated at regular intervals.

The square root relation existing between rate of flow and pressure difference (the latter being translated into recorder pen travel) is reproduced in the relation between angular travel of disc L and pen deflection by means of the oscillating latch carrier N being driven by the rotating sector K, through a link N-1 shown in Fig. 3.

Tripping blade O which is attached to the recording pen shaft O-1 releases the latch at the proper point, according to the reading of the instrument, the motion of the pen never being restricted by the tripping operation.

The angular relation between the uniform rotation of sector K and the rocking motion of arm N is an almost exact reproduction of the square root law through a large portion of the downward motion of arm N and a slight departure from the exact relation desired is taken care of by the shape of tripping blade O. A roller on the end of arm N passes across tripping blade O, which is very thin, and holds O fast against a plate while latch L-1 is being tripped.

Two important features of this design are: First, the parts are simple and can be made accurately under practical manufacturing conditions so that the square root relation is always reproduced correctly by the mechanism; and, second, such a simple integrating mechanism which reproduces the square root relation permits the employment of the inductance bridge method of transmitting the meter readings.

When roller L has turned through a definite number of revolutions a pawl is released which thereupon engages with a toothed pinion of the chart-driving gear train. This causes a cam Q, Fig. 4, to make one complete revolution after the pawl is released and the cam then remains at rest until the roller again completes the proper number of revolutions.

As the cam Q advances, a cam arm R is gradually raised, lifting the arm of ratchet counter S until the high point Q-1 of the cam passes, then the cam arm falls quickly and advances the reading of the counter by one unit without allowing the figures to pause in a half-way position difficult to read.

Each time the cam arm falls the recording planimeter pen T makes a jog U in its record line, every tenth jog U-1 being in the opposite direction to facilitate counting when desired. The five-figure integrator dial S can be read at any given hour or hours of the day, and records made on the chart elsewhere if desired; but the record of the recording planimeter can take the place of these counter readings and affords the added advantage of making a record from which the total flow can be read off for any desired fraction of a day at any subsequent time which may be convenient—eliminating the necessity of having an observer on hand at the proper hours to note the readings of the counter as they occur.

A series of printed charts are chosen with a fixed ratio between successive ranges. The manometers also are arranged to be adjusted for several appropriate ranges. This simplifies the choice of an orifice plate, the size of which depends chiefly upon the density of the fluid and the pipe size. With such an orifice the apparatus is easily adjusted for successive chart ranges by using a stand-pipe of proper size in the manometer. This is useful where the average local changes from time to time, for then the apparatus can be readjusted by changing the manometer stand-pipe—instead of changing the orifice plate which is much less convenient.

The various manometers for use with steam, operate on successive maximum pressure differentials increasing by intervals of about 60 per cent, ranging from 1.6 inches to 16 inches of mercury. There are six ranges in this series, the choice of a suitable manometer depending upon velocities encountered. Any manometer of the series, however, may be converted into the most sensitive one by simply opening a valve. This adapts the meter for use with one of the lower range charts, making it easily convertible for low load periods.

Where the apparatus must work on very low pressure differentials an especially sensitive type of manometer is provided, the most sensitive of which gives full deflection of the meter on a pressure difference of one-half inch of water, although the operating force of the meter mechanism of this high-sensitivity series is as great as that of the high-range manometers.

Additional information will be supplied by The Brown Instrument Company, Philadelphia, Pennsylvania.

Terry Turbine Publication for Distribution

"The Terry Turbine" is among the latest publications of the Terry Steam Turbine Company, Hartford, Connecticut, and is for free distribution to any one interested in steam turbines.

The bulletin includes a description of the various types of Terry multi-stage turbines, together with analyses and photographs of typical installations.

Copies of this, as well as other Terry bulletins can be obtained upon request.

Bristol Voltmeter Catalog Off Press

Recording Voltmeters manufactured by The Bristol Company, Waterbury, Connecticut, are featured in a catalog recently published by that company. These voltmeters include a great variety, suitable for any kind of service where voltmeters are needed.

Detailed descriptions are given of all the instruments, with various illustrations.

Copies may be obtained by asking for Catalog No. 1502, Voltmeter Section.

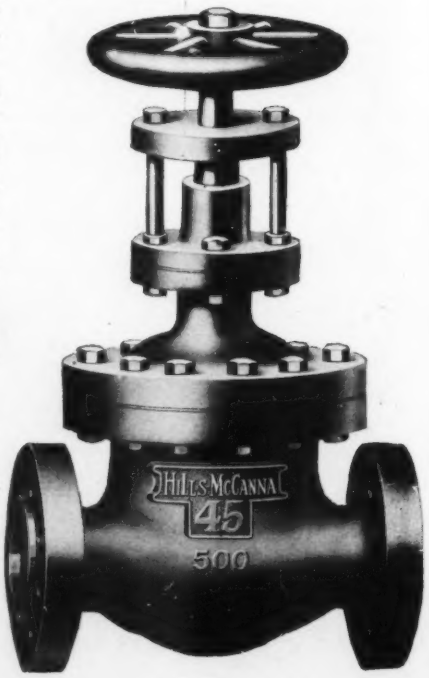
Hills-McCanna Offers Valve of No. 45 Bronze

Hills-McCanna Company, 2025 Elston Avenue, Chicago, Illinois, is now offering corrosion resisting bronze, said to have the strength of steel.

The gate valve, cut of which is shown herewith, is the high pressure type for hot oils and petroleum vapors.

This valve is the ordinary parallel seat type with all parts made extra heavy for regrinding, and interchangeable, its feature of superiority being in its corrosion resisting qualities. This eliminates the possibility of electrolysis or galvanic action.

Additional information will be furnished by the company to any one requesting the same.



No chance of a a leak here!

HIGH PRESSURE! High temperature! They mean nothing to Pennsylvania Forge Flanges. Joints stay sealed under all conditions. Forged of specially selected open hearth steel, these flanges withstand every shock or strain. No amount of vibration—expansion and contraction—temperature changes—water hammer—can injure them. No possibility of blow holes or other hidden defects.

Pennsylvania Forge Flanges will save for you everywhere—on the cracking stills—in the paraffine department—asphalt department—steam lines—gathering and distributing lines.

Test specimens cut cold from a Pennsylvania Forge Flange will show a tensile strength of 55,000 to 60,000 lbs. and an elastic limit of 30,000 lbs.

Unusual service is made possible by our huge stock and tidewater location.

PENNSYLVANIA FORGE COMPANY
PHILADELPHIA

Distributors

San Francisco:
Chas. S. James, 525 Market Street

St. Louis, Mo.:
W. R. Maxell, 915 Olive St.

Philadelphia, Pa.
Ford & Kendig., 1423 Callowhill St.

Boston, Mass.
E. B. Badger & Son Co., 75 Pitts St.

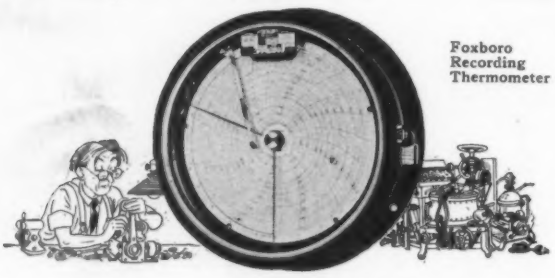
The strength of the line is only the strength of the Flanges

Helpful Book Free

A. S. M. E. Standards on pipe and boiler flanges and a mass of kindred data arranged in handy form. Your name on a post card will bring a copy with our compliments.

PENNSYLVANIA FORGE CO.

Mention Where You Saw the Advertisement



Foxboro Recording Thermometer

Simplicity Is Efficiency

THE patent office is full of the impractical dreams of long-haired inventors. For every successful machine in use today there are scores of complicated models which could not stand the acid test of service.

Simplicity marks the winners.

Take the actuating movement of a Foxboro Recording Instrument. Here is strength with the least weight and smallest number of moving parts. Excess friction, lost motion, inertia and momentum have been eliminated.

It is the simplest, most accurate, trouble-proof actuating movement ever developed.

Or the Round Form Case introduced seventeen years ago. The Suspended Pen Arm. The Three-Point Support Clock Movement. The friction-type, accurately centered Chart-Holder. Each the simplest, most efficient design possible.

These features have made Foxboro Recorder-Controllers and Recording Thermometers standard in most Refineries.

They make it possible to guarantee every Foxboro Instrument to be permanent in calibration and accurate to within less than 1 per cent of total scale range. Write for Bulletins.

THE FOXBORO CO., INC.

Neponset Avenue, Foxboro, Mass., U. S. A.

205 So. Cheyenne Avenue, Tulsa, Okla.

New York Chicago Boston Philadelphia Pittsburgh
Cleveland Rochester Atlanta Los Angeles
San Francisco Portland, Ore.

FOXBORO
REG. U.S. PAT. OFF.
THE COMPASS OF INDUSTRY

AMERICAN
RECORDING THERMOMETER

(formerly "Columbia") has many valuable exclusive features; such as Time Punch; non-removable chart button; interchangeable recording system; instructions on chart plate, etc.

Write for Catalog H 16

AMERICAN SCHAEFFER & BUDENBERG CORP.
BROOKLYN, N. Y.

*Boston Cleveland Salt Lake City
Buffalo Detroit *Seattle Philadelphia
*Chicago *Los Angeles Tulsa *Pittsburgh

*Stock carried at these branches.

Oil Burner Uses Minimum Amount of Steam

A new oil burner is now being manufactured and sold by F. Beers & Company, Newark, N. J. Careful tests have demonstrated that it uses only 1.3 per cent of steam.

It is exceedingly simple, has only three parts and is adaptable to any kind of flame to suit any type of furnace. It protects itself from overheating by absorbing the heat radiating through the cap into the steam used for atomizing.

The design of this burner is such that it causes the steam to break up the oil into very minute particles. The breaking up is done inside the burner.

Four inside steam jets are employed, all acting at right angles with four oil jets.

The burner's small size gives it a number of important advantages. It does not project far into the furnace, hence there is little danger of overheating, carbonizing, and clogging.

The correct size of oil and steam ports is determined by the pressures available and the capacity required.

In one test the manufacturer states that a P. & B. Burner, with 75 pounds oil pressure and 120 pounds steam; oil temperature 120 degrees F., 14 Baume gravity, four ¼"x3/64" steam ports and four ¼"x1/16" oil ports; with a ⅛"x1 3/16" burner tip, actually developed 1000 boiler h. p. per hour, maximum. The same burner developed a minimum of 25 boiler h. p. per hour, with a steady and perfect small fire. The burners can be altered for both larger and smaller capacity by changing the oil and steam ports along with the tip openings.

The burner head is made of cast iron. When the two sections are bolted together by the four cap screws they are perfectly steam and oil tight without the use of any gasket. The central plug is held in position by a 5/16" cap screw and is also oil-tight without the use of a gasket. The plug is held in a central position so that equal amounts of mixture pass through all of the surrounding ports. At the same time equal amounts of steam pass through the ports from the steam section, impinging against the oil jets, and in the space surrounding the plugs the oil becomes completely broken up and vaporized and mixed with steam.

Wilson-Snyder Boiler Feed Pumps Described

Wilson-Snyder Long Stroke Boiler Feed Pumps are the subject of Bulletin W-79 B, put out by the Wilson-Snyder Manufacturing Company, Pittsburgh, Pennsylvania.

Wilson-Snyder pumps cover a variety of uses, all of which are explained in the bulletin. Copies can be secured upon request to the company.

Here is the Answer:

Aluminum paint has been described as "the coat of metal". Why? Because when properly made and properly applied it does produce an enduring metal-like film.

But what holds that coat of metal intact? There is only one answer. It is the film—the bond produced by the mixture of oils and gums which constitute the vehicle in which aluminum bronze pigment is carried.

Therefore aluminum paint will serve just so long as there is life and bond in the film to hold together the tiny metallic flakes.

Silvr-Cool, the super-aluminum paint has shown such highly satisfactory service records because it is scientifically made—because its vehicle insures maximum life and bonding properties—because its vehicle has been proven from the standpoint of quality and suitability.

Silvr-Cool is a superior product—quite apart from the ordinary in aluminum paints.

Silvr-Cool leafs perfectly
Silvr-Cool does not deteriorate in the package
Silvr-Cool comes to you ready mixed for use
It costs less per year

SILVR-COOL

The Super-Aluminum Paint

—IS MADE BY—

Detroit Graphite Company

DETROIT, U.S.A.

Manufactured **in Canada by Dominion Paint Works, Limited, Walkerville, Ontario.** ***Offices*** **at all principal centers.**

Charcoal Absorption—The Oretical Considerations

By A. J. L. HUTCHINSON*

IT has been known for a long time that charcoal would take up large volumes of gases but the commercial application of this property is relatively new. About 1900, Dewar in England patented the use of charcoal for producing high vacua. He sealed a bulb containing charcoal to the apparatus to be evacuated, heated the charcoal and pulled a vacuum on the apparatus with the usual types of pumps. He then cooled the charcoal down to a low temperature and obtained very high vacua.

Not much work was done on charcoal from this time until shortly before the war when it was found that different chars showed marked differences in adsorbing power. When the war came on and gas warfare became a reality it was necessary to produce some substance that would completely remove from air small traces of the war gas. As all of these gases are accumulative poisons even a trace passing through the protective device would be fatal. Chemical means could not be resorted to as the gas showed only one common property—being poisonous. From the previous work that had been done on charcoal, this substance was naturally turned to to fill the gap and extensive and intensive work was done on it with the results we all know.

After the War

The situation at the close of the war was that we were fairly well acquainted with the properties of charcoal, we knew how to prepare chars of high adsorptive capacity, and had developed an extensive surplus of raw materials. When the war closed the industries obtained the information gained by the government on charcoal and began putting it to use in their processes.

Since that time, considerable work done during and after the war has been published on the purely scientific side. The following is a brief abstract of the most important work done that bears on our present problems.

The principles underlying the adsorption of gases and solids by charcoal and other solid adsorbents have been the subject of considerable study. From this study several theories have been evolved, none of which have been definitely proven to date. These theories can be divided into two main classes—one theory assumes the surface of the charcoal to be covered by a layer of highly adsorptive material; the other that adsorption is due to surface forces exerted by the surface layer of the charcoal molecules or by capillarity of the very small pores in the charcoal.

There are two conditions that lead to the theory that the surface of the charcoal is covered by a layer of highly absorbing material. In the preparation of adsorptive charcoal the raw material is carbonized at a low temperature and treated at much higher temperatures with super-heated steam, air or a mixture of super-heated steam and air or other gases. This treatment distills out and oxidizes the heavy hydro-carbons that were formed during the charring period. It has been found necessary to stop this activating process before all the hydro-carbons have been removed. Some investigators have shown that the adsorbing power of charcoals they prepared was a function of the hydrogen content of the char, increasing with the decrease of hydrogen to a certain point and then decreasing as the hydrogen content was further decreased. This theory is more or less borne out by X-ray analysis of the charcoals which show they are graphite with small amounts of hydrocarbons mixed with it. Specially treated graphite, free from hydrogen, shows marked adsorbing properties.

Charcoals thoroughly outgassed at high temperatures show a very high adsorption of oxygen which takes place at first very rapidly and then over a long period at a slow rate. On heating and evacuation only part of this oxygen is recovered as oxygen, the rest as carbon monoxide and carbon dioxide usually in molecular proportions. This has led to the theory that adsorption is due to solution in a layer of solid oxide of carbon of the formula C_2O_3 or CxOy. This solid oxide of carbon has never been isolated and identified. If the above two theories are correct it seems unlikely that any other substance would show adsorptive properties, however a large number of solids show this property, notably silica gel.

More Evidence

The exponents of the theory that the adsorption is due to surface forces have much more evidence to support their theory. It has been shown that the amount of gas or vapor taken up by charcoal is a direct function of the surface of the charcoal. The surface of the charcoal is considered as the external surface and the internal surface of the minute capillaries in the charcoal grain. This surface has been calculated from a number of different results and gives for a highly activated charcoal a surface of the order of 105 sq. c.m. per gram of charcoal and a pore space within the charcoal of .6 cu. c.m. per cu. c.m. of charcoal. From this surface on the charcoal it is calculated that gases or vapors are adsorbed in a layer one molecule thick.

This theory is clearly borne out by the fact that the vapor pressure curve at constant temperature of a vapor on charcoal is very close to a constant up to the saturation point of a monomolecular layer, it then makes a sharp break and gives an indication of hitting a constant value for the formation of dimolecular layer.

Effect of Heat

The heats of adsorption have been studied and found that for like heats of adsorption the mass of gas adsorbed per square centimeter of surface is the same. This heat is much higher than can be attributed to the laten heat of the substance and is equivalent to the heat of compression of the liquid to 37,000 atmospheres pressure. This is of the same order of magnitude as the forces in the carbon linkage.

This has led to the theory that the adsorbed film was held by the free valences of the oriented surface layer of carbon molecules.

A calculation of the capillarity of the small pores of the charcoal, which are sub-microscopic and their diameters of the same order of magnitude as molecular diameters, gives vapor pressures that follow closely the observed vapor pressures for some substances and almost exactly for water. By very careful work it has been shown that water is held on charcoal solely by this capillary action while other substances more closely follow the theory of free valences.

The effect of the presence of one gas adsorbed on charcoal on another gas is dependent on the solubilities of the two gases in the liquid state. If the two liquids are mutually soluble the saturation point is slightly higher than for one of the gases alone. If, however, the two gases are insoluble in the liquid state, the presence of the one gas will retard the rate of adsorption of the other, but will affect its equilibrium point very slightly. When two gases are passed through charcoal to the saturation point of the charcoal the charcoal shows strong selective properties. As a general rule the gas having the higher critical temperature will

*Research Engineer of Pacific Gasoline Company.

Texas Fire Brick

—a high quality fire brick now serving Southwestern Refiners who once thought more costly brick necessary to their needs.

for figures and facts write any member of the

Texas Fire Brick Manufacturers' Association

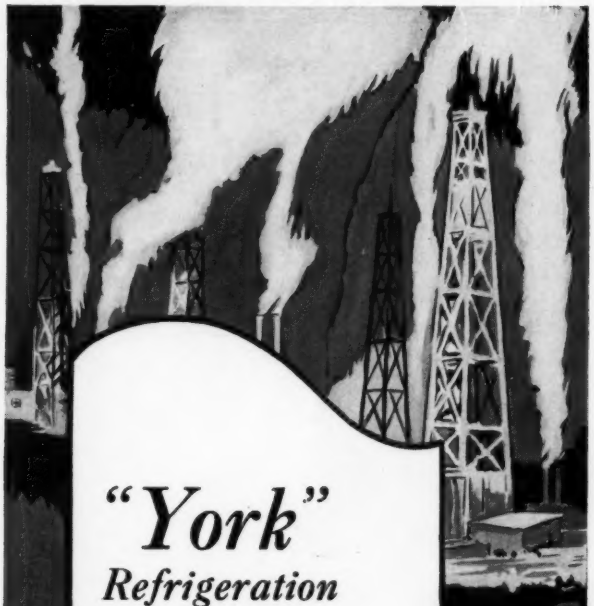
Promoting Fire Brick Economies Through the Use of Texas Fire Brick

Texas Clay Products Co., Malakoff, Texas

Acme Brick Co., Ft. Worth, Texas

Athens Brick & Tile Co., Athens, Texas

Elgin Butler Brick Co., Austin, Texas



"York" Refrigeration for the Refinery

YORK Absorption Refrigerating Machines are built in either the double pipe, atmospheric, or shell and tube type, and consist principally of the following parts:

GENERATOR,
ANALYZER,
DEHYDRATOR,
CONDENSER,
EXCHANGER,
WEAK AQUA COOLER,
ABSORBER,
STRONG AQUA TANK,
ANHYDROUS AMMONIA RECEIVER, AND AQUA AMMONIA PUMP.

This equipment is particularly adaptable to Refinery requirements, and can be relied upon to deliver low, dry temperatures WHEN and WHERE needed.

Write the nearest YORK Branch (there are 74 of them) for full particulars.

YORK Manufacturing Company
Ice Making and Refrigerating Machinery Exclusively
York, Penna.

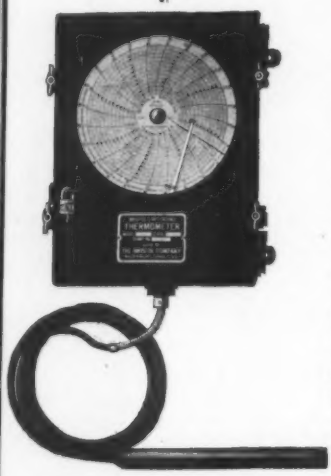
YORK MFG. CO.
York, Penna.

Please send me further information on "York" Refrigeration for the Refinery.

Name . . . . . .

Address . . . . . .

Bristol's Control Often Swings the Balance from Loss to Profit



Bristol's Recording Thermometer with Moisture-Proof Case

When there are Bristol's instruments controlling refinery processing the refining is done right the first time—there are no expensive re-runs, no shipments turned down because they don't meet specifications.

You know how a few bad guesses can take the profit completely out of refinery operation, so protect yourselves thoroughly with Bristol's instruments.

Bristol's recording instruments are available for almost every phase of refinery work. Talk over your situation with your nearest Bristol man; there's no obligation involved.

The Bristol Company Waterbury, Connecticut

FOR 36 YEARS Ask Any Technical Engineer MAKERS OF

BRISTOL'S RECORDING INSTRUMENTS

BRANCH OFFICES:

Boston, New York, Philadelphia, Birmingham, Detroit, Chicago, San Francisco, Pittsburgh, St. Louis, Denver

62 Oil and Refining Companies now using the

Mettler Entrained Combustion Gas Burners

For All Purposes, Kinds of Gas, Pressures

Write for Latest Condensed Catalog

Lee B. Mettler Co.

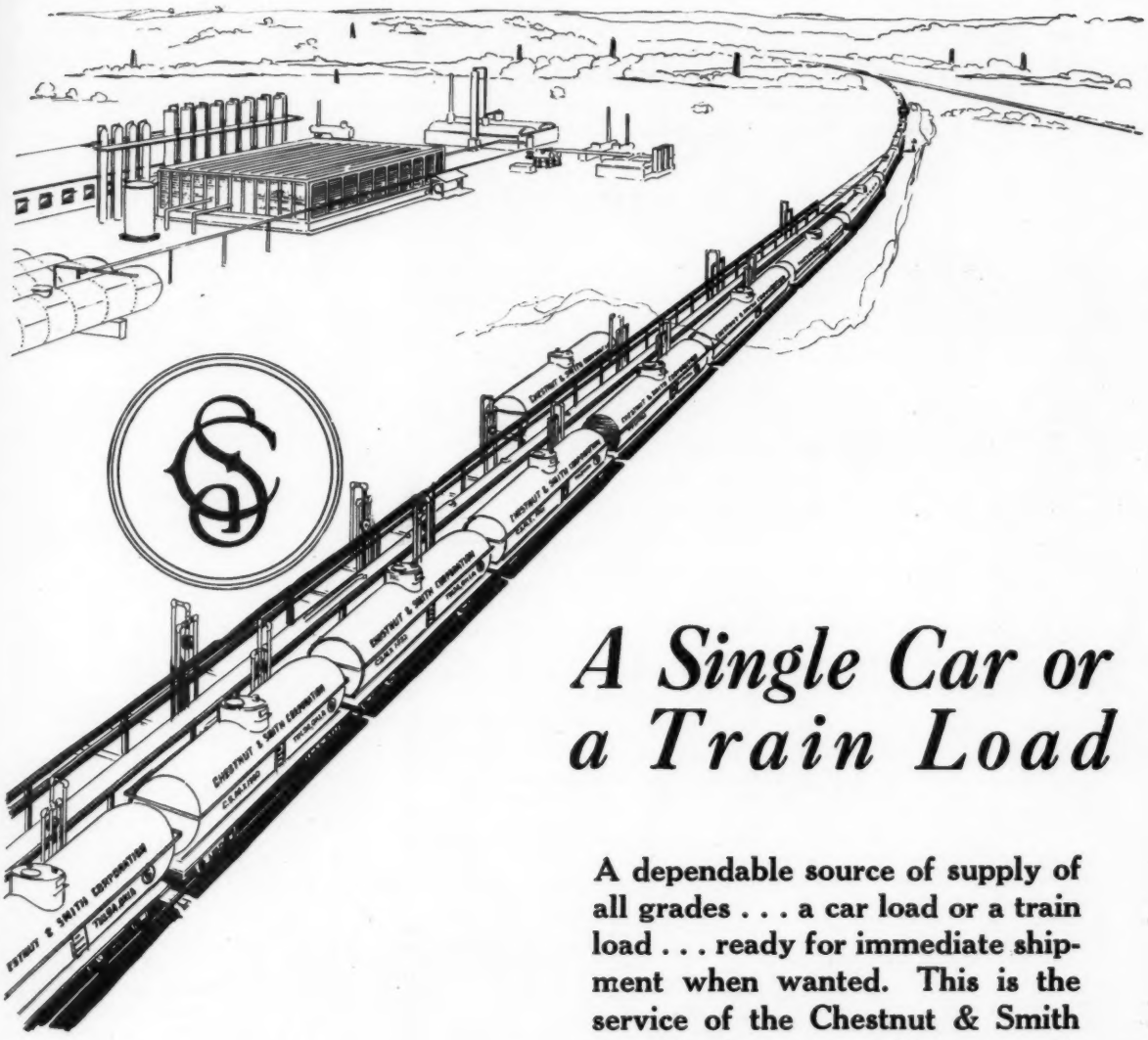
406 S. Main St. Los Angeles, Cal.

displace from the charcoal the gas with lower critical temperature. This displacement is not complete but follows the law of mass action.

Why Temperature Increases

In a gaseous mixture of hydrocarbons of a homologous series such as natural gas, the mass of gas or vapor that can be taken up by the charcoal is roughly a function of the boiling points or critical temperatures. This explains why a series of temperature increases occur when natural gas is passed through charcoal. The methane first passing through the charcoal gives the first temperature rise, the second temperature rise is due to the difference in the heat of adsorption of the ethane and methane, more ethane being adsorbed than methane. In the same way the third and fourth temperature rises are due to the replacement of ethane by propane, and propane by butane. The relative height of these temperature rises depends on the composition of the gas, the shape of the charcoal tube, and the rate the gas is passed through the tube. These temperature rises can not be taken as an absolute indication of the saturation of the charcoal as gases are known where only one temperature rise is observed, others where two only appear, and others where there are three and no more.

In the use of charcoal for testing the gasoline content of natural gas, the weakest point in the method lies in the distillation. The vapor pressure of the gasoline constituents on charcoal is practically zero at the temperatures ordinarily reached during adsorption. Therefore these constituents are removed quantitatively from the gas, provided the saturation of the charcoal has not been exceeded or the rate of addition of these compounds in the gas has not exceeded the rate of adsorption. During the distillation some of these compounds are carried through the condenser in the vapor phase by the fixed gases that have not been completely displaced. Also, if the rate of distillation is too great a large percentage of the gasoline coming off with the fixed gases is lost and the final temperature may be reached before all the gasoline constituents have been displaced from the interior of the charcoal grains. Pressure during distillation will retard the giving up of the heavier constituents from the interior of the charcoal. In the distillation with steam in the commercial plants the temperature reached is not high enough to remove all of the heavier constituents. These constituents gradually build up and in time will reduce the adsorptive capacity of the charcoal for the lighter constituents to such a point that it becomes necessary to remove the charcoal from the plant and reactivate it.



A Single Car or a Train Load

A dependable source of supply of all grades . . . a car load or a train load . . . ready for immediate shipment when wanted. This is the service of the Chestnut & Smith organization . . . a service responsible for our present position in the NATURAL GASOLINE industry. . .

Regardless of your requirements . . . large or small . . . you can depend upon the prompt execution of your orders.

CHESTNUT & SMITH
CORPORATION
Tulsa, Oklahoma
Chestnut & Smith Building
7th and Cheyenne

Mention Where You Saw the Advertisement

RECENT REFINERY PATENTS

BY STAFF REPRESENTATIVE

Washington, D. C.—The following patents of interest to the refining industry have been granted by the United States Patent Office:

No. 1,600,437, granted September 21 to Rene De M. Taveau, Elizabeth, N. J., assignor to The Texas Company, New York, for a method of treating crude alcohols derived from cracked petroleum gases which consists in distilling the alcohols over non-aqueous alkali.

No. 1,600,441, granted September 21 to George D. White, Port Arthur, Texas, assignor to The Texas Company, New York, for an electric insulator for stills, consisting in combination with a pressure still of a substantially cylindrically shaped member in open communication at one end with the still and having an inwardly projecting annular flange near its opposite end, an insulating member having a vertically disposed central orifice disposed in the chambered member and supported by the annular flange, an electrical conductor extending through said central orifice into the still and having an enlarged portion supported by the insulating member, a second insulating member spaced from the first named insulating member by the enlarged portion of the conductor, and means for securing the insulating members in position, and for an insulator which comprises the combination with a conductor having an annular shoulder, of a pair of tubular members through which the conductor extends, flanges on said tubular members, an insulating member mounted in a recess in one of the tubular members and abutting said shoulder, another insulating member positioned in the other tubular member and abutting said shoulder and formed to provide an annular space between the tubular member and a portion of the insulating member, packing material disposed in said annular space, a gland for said packing material and means for securing the gland and flanges of the tubular members together.

No. 1,600,721, granted September 21 to Carbon P. Dubbs, Wilmette, Ill., assignor to Universal Oil Products Company, Chicago, for a process of treating hydrocarbon oils consisting in continuously passing the oil in relatively small streams through vertical tubes seated in a furnace wherein the oil is subjected to a cracking temperature, in passing the oil from said tubes into an expansion chamber where a substantial vaporization occurs and from which no unvaporized oil is permitted to return to said streams, in passing the vapors issuing from said chamber through a dephlegmator in continuously passing raw oil through said dephlegmator to come in physical contact with the vapors therein to preheat the raw oil and condense the heavier fractions of the vapors, in condensing the uncondensed vapors issuing from said dephlegmator and in collecting the resulting distillate, in passing reflux condensate and raw oil from said dephlegmaotr to the lower ends of said vertical tubes and in maintaining a superatmospheric pressure on the system.

No. 1,600,845, granted September 21 to Herman Reinbold, Omaha, Neb., for an oil treating medium comprising a colloidal sodium silico aluminate admixed with sodium hypochlorite.

No. 1,601,215, granted September 28 to Ernst Johansen, Fall River, Mass., assignor to New England Oil Refining Company, Fall River, for a motor fuel which comprises a solution in petroleum hydrocarbons of compounds of a metallic oxide with sour distillate components, said compounds being soluble in said fuel.

No. 1,601,216, granted September 28 to Ernst Johansen, Fall River, Mass., assignor to New England Oil Refining Company, Fall River, for a process of making a liquid fuel for internal combustion engines, which comprises treating sour distillates with a metallic oxide capable of forming, with sour distillate components, compounds soluble in the fuel.

No. 1,601,405, granted September 28 to Herbert Raymond Moody, New York, for a method of treating sludge-forming oil to render sludge-forming constituents thereof non-sludging, which comprises treating the same with aluminum carbide and aluminum chloride at an elevated temperature.

No. 1,601,421, granted September 28 to Edson R. Wolcott, Los Angeles, assigner to The Texas Company, New York, for a process of treating hydrocarbon oils that comprises continuously passing the oil through a series of pools, heating and cooling alternate pools, introducing aluminum chloride material to the cooled pools and removing and condensing vapors generated from the heated pools.

No. 1,601,727, granted October 5 to Warren F. Faragher, William Arthur Gruse and Frederic Horace Garner, Pittsbugh, Pa., assignors to Gulf Refining Company, Pittsburgh, for a method of cracking oils which comprises heating a body of oil in a still to a cracking temperature by the external application of heat to the still, subdividing the main body of oil in the still into a plurality of vertically disposed smaller bodies freely communicating at their upper and lower ends respectively, and causing circulation of the oil in the still in a plurality of paths or cycles by introducing upwardly flowing gaseous currents acting on the "air-lift" principle into some but not all of the subdivided smaller bodies near the lower end thereof.

No. 1,601,728, granted October 5 to Warren F. Faragher, William Arthur Gruse and Frederic Horace Garner, Pittsburgh, Pa., assignors to Gulf Refining Company, Pittsburgh, for a method of cracking oils in a horizontally arranged still which comprises heating a body of the oil therein by external heat to the cracking temperature under pressure, subdividing the main body of oil in the still into a series of transversely arranged smaller bodies communicating with each other at their upper and lower ends, introducing the oil to be cracked at one end of the still and withdrawing the residue from the other, and maintaining effective circulation of the oil in the said transversely arranged bodies and along the heated bottom of the still by the introduction of gaseous currents, acting on the "air-lift" principle, near the lower ends of the subdivided smaller bodies.

No. 1,601,729, granted October 5 to Warren F. Faragher, William Arthur Gruse and Frederic Horace Garner, Pittsburgh, Pa., assignors to Gulf Refining Co., Pittsburgh, for a mehod of fractionally distilling petroleum oil and the like, which comprises externally heating a body of the oil in a still below the cracking temperature causing the oil to circulate over vertically directed paths between the top and bottom parts of the body of oil and laterally at the top and bottom parts of the body, by introducing upwardly directed gaseous currents acting on the air-lift principle, the oil circulating upwardly from the point of gas introduction, whereby the formation of dead layers of oil is prevented and effective mixing throughout the body of oil is promoted to maintain substantial uniformity of temperature throughout the oil body, and collecting the distilled vapors.

No. 1,601,730, granted October 5 to Warren F. Faragher, Pittsburgh, and William A. Gruse, Wilkinsburg, Pa., and Frederic H. Garner, Fawley, Eng., assignors to Gulf Refining Company, Pittsburgh, for a process and apparatus for cracking hydrocarbon oils, the former consisting in a method of cracking oils in a horizontally arranged drum still, heated by external heat over its lower surface, of the step which comprises preventing deposition of carbon in the bottom of the still and stagnation of oil within the still by causing circulation of the entire body of oil by injecting a gaseous current into a flue within the still and at a point within the flue itself; and an apparatus for cracking oils comprising a horizontally arranged drum still, means

for heating said still externally, means for preventing deposition of carbon in the bottom of the still and stagnation of oil within the still consisting of baffles spaced from each other which, with the wall of the still, form flues, and means for introducing a gaseous current into each flue at points within the limits of the flues.

No. 1,601,753, granted October 5 to Theodor Hellthaler, Granschutz, Germany, assignor to the Firm: Hugo Stinnes Riebeck Montan und Olwerke Akt. Ges., Halle-on-the-Saale, Germany, for a process of refining mineral oils which consists of treating the oils with anhydrous antimony pentahalids.

No. 1,601,777, granted October 5 to Chester A. Spotz, Greenwich, Conn., for a method and apparatus for distilling crude oils from shale, which consists in moving said material substantially horizontally below the surface of a bath of heated fluid metal of higher specific gravity than the said material, allowing the finer particles of the material to rise to the surface of the bath, moving said particles along the surface of the bath to be discharged with the spent submerged material, and carrying off the volatile products arising from the surface of the bath under constant exclusion of air.

No. 1,601,786, granted October 5 to Joseph B. Weaver, Chicago, assignor to Oil Products Company, Toledo, Ohio, for a process of treating hydrocarbon oil which comprises vaporizing the oil, then while the oil is in the vapor phase converting the oil at a temperature in excess of approximately 1000 degrees F., and immediately upon completing the conversion in the vapor phase rapidly cooling the products of conversion to a critical tempreature less than approximately 600 degrees F., above which critical temperature the cooling will produce a deposit of substantially all the carbon that will be formed in cooling, collecting the carbon so formed in a manner suitable for convenient removal and then continuing the further treatment of the products of conversion at a temperature sufficiently low to produce no further substantial carbon deposit.

No. 1,602,310, granted October 5 to Michael Melamid, Freiburg, Germany, for a process of treating tars, crude mineral oils and similar substances and preventing the separation of carbon and pitchy matter in the catalytic decomposition thereof, which consists in highly dispersing such material in the presence of hydrogen, and thereby converting said material into a foggy, gas-like condition, and treating the mixture obtained at a high temperature exclusively with a metal catalyzer in a substantially pure, metallic condition and liquefying at the temperature of reaction, and incapable of the formation of carbides.

No. 1,602,703, granted October 12 to Ralph C. Pollock, Long Beach, Calif., assignor to Union Oil Company, Los Angeles, for a process of clarifying

Protect Your Oil From Evaporation and Fire

EVAPORATION and fire take a huge toll of the oil industry. Wiggins Roofs are designed to give complete protection to oil storage by blanketing the oil surface to practically eliminate evaporation and to stop fire.

The steel deck which rides the oil is sealed against the shell with a fire-safe, gas-tight seal. Vapor space is reduced to the very small volume beneath the seal, so that losses through thermal breathing are negligible. Splash-over is prevented. The seal acts as a separating space which collects air accidentally pumped into the tank and holds it until it loses its entrained oil, which returns to the tank. A self-closing vent discharges the air, oil-free, to atmosphere.

Wiggins Roofs protect equally well whether tank is full, partly full, filling, or emptying. Write for a quotation on them for your present tanks or for new tanks and roofs complete.

Chicago Bridge & Iron Works

Chicago, 2463 Old Colony Bldg. Dallas, 1655 Praetorian Bldg.
New York, 3102 Hudson Terminal Bldg. Atlanta, 1046 Healey Bldg.
Cleveland, 2234 Union Trust Bldg. San Francisco, 1051 Rialto Bldg.

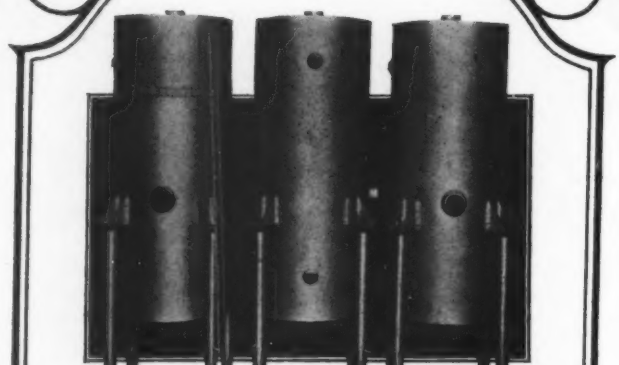
WIGGINS ROOF

R&NG11-Gray

NORTH AMERICAN CAR CORPORATION
N.A.
TANK CARS
LEASED AND REPAIRED
NORTH AMERICAN CAR CORPORATION
327 S. LaSalle St., Chicago, Ill.
Tank Cars for Lease
Domestic and Export Terminals: Chicago, Tulsa, New Orleans

Power Piping

FOR EVERY OIL FIELD NEED



Receiving and Separating Tanks

We fabricate welded receiving, separating and blow-off tanks for all purposes, in addition to our other varied activities in refinery piping equipment. Illustrated is a group of three separating and receiving tanks for an Ohio refinery.

POWER PIPING COMPANY

PITTSBURGH

PUT YOUR PIPING PROBLEMS UP TO POWER PIPING

SOUTHERN CORNICE WORKS

Manufacturers of

"SOCO" STATIONARY AND REVOLVING VENTILATORS

For Refinery And Natural Gasoline Plants

Oil Field Work A Specialty

Phone 2-1546 TULSA, OKLAHOMA 118-20 S. Cincinnati

gasoline which consists in agitating the gasoline in the presence of from 1/40 to 1/5 of a pound of sulphuric acid per barrel of the gasoline, and from 1/10 to pounds of clay per barrel of the gasoline, and finally separating the residue and the clarified gasoline.

No. 1,602,705, granted October 12 to Nola C. Riley and Robert B. Green, Holdenville, Okla., for a gasoline purifier comprising, in a decanter, a plurality of tanks, one within the other, and each having inclined bottoms, a common removable closure for said tanks, said closure being supported by the outer tank and solely supporting the interior tank, drain conduits attached to the inclined bottoms of each tank, an inlet for the inner tank terminating adjacent to the outlet conduit of the inner tank, a conduit extending from the upper portion of the inner tank to a point adjacent the outlet conduit of the outer tank.

No. 1,602,990, granted October 12 to Robert T. Pollock, Boston, assignor to Universal Oil Products Company, Chicago, for a dephlegmating process for separating insufficiently cracked vapors from the sufficiently cracked vapors while said vapors are passing through a dephlegmator, which comprises continuously circulating a cooling medium in a closed ring, a portion of which ring includes the dephlegmator where the cooling medium is in heat interchanging relationship with the vapors, in removing a portion of the medium from the ring, and in replacing the removed portion with fresh cooling medium from a source extraneous of the ring.

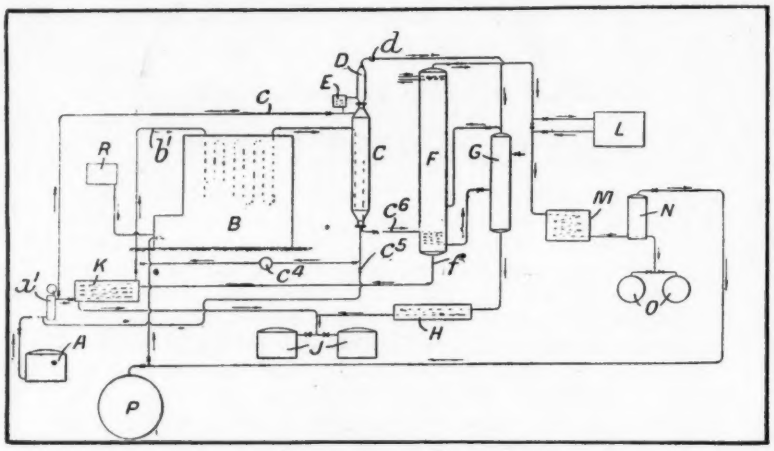
No. 1,603,174, granted October 12 to James W. Weir, Fillmore, Calif., for a method of refining lubricating oil stocks which comprises treating the oil with sulphuric acid, settling and removing the major portion of the sludge, then agitating the oil stock with a fresh comminuted solid adsorbent material at a temperature below that at which the sludge decomposes to gather the solid suspended sludge, separating the adsorbing material with the matters adsorbed thereon from the oil stock, heating the mixture to a temperature sufficient to decompose the remaining sludge and liberate sulphur dioxide therefrom, and separating the adsorbent material with the matters adsorbed thereon from the oil stock.

J. B. Simler, district sales manager of Bruce-Macbeth Engine Company with offices in Tulsa, has recently returned from an automobile trip East that carried him to the company's home plant at Cleveland and other points in Ohio and Pennsylvania. He made the return trip by way of St. Louis.

EXTRACTS OF REFINING TECHNOLOGY

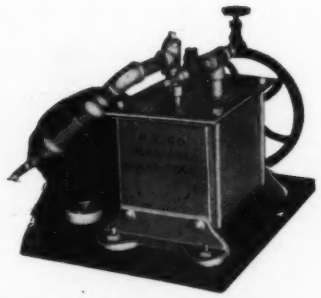
Cracking Hydrocarbons.—In cracking hydrocarbons in the liquid phase by passing the oil into the cracking chamber C, as indicated in the accompanying illustration, which is maintained at the cracking temperature and under high pressure, the light products pass away through a reflux chamber D from which the heavy products are refluxed through a cooler E to the chamber C. The vapors pass through a valve to an expansion chamber G, from which liquid passes through a cooler H to the fuel oil receivers J. The vapors pass through a dephlegmator F, a vapor-refining apparatus L, condenser M, and gas separator N to the receivers O.

The heavy liquid from the dephlegmator F is passed through a heat exchanger K to the receivers J. Oil to be treated is drawn by a pump a^1 from a tank A and is forced either through the heat exchanger K and a pipe still B, heated either by oil from a tank R or by waste gases from the process from a gas holder P, into the cracking chamber C or directly into this chamber through a pipe c.



The cracking chamber C is preferably lagged and not separately heated but may be heated by oil or gas burners. by electrical means or by superheated steam. Oil from the base of the chamber C is passed by a pump c^4 to the inlet pipe b^1 of the tube furnace or through a valve c^5 to the inlet side of the pump a^1. The upper layers of oil pipe c^6 through a coil f in the base of the dephlegmator F and thence into the expansion chamber G. The chamber D is at the same pressure and is maintained at a lower temperature (200 to 400 degrees C.), heating or cooling medium being passed through a jacket surrounding it if necessary. The expansion chamber G is maintained at about 75 pounds pressure and 350 degrees C. British Patent No. 248,115.

Portable Vacuum Pumps With Electric Motor



WRITE FOR ADDITIONAL INFORMATION

Special Crowell O-D Vacuum Pump with leak-proof cover mounted on board complete with special Motor, Filter, Check Valves and Switch. Ready to connect in field Testing Car. Runs on 6 or 12-volt Storage Battery. Readily pulls within one inch (mercury) absolute pressure, valuable in securing a continuous representative flow of gas from vacuum lines for:

(1) Samples for analysis.
(2) Specific gravity tests by Gas Balance or Effusion Bottle.
(3) Air content tests.
(4) Gasoline content tests by charcoal method.

THE REFINERY SUPPLY COMPANY

Main Office
Fourth and Detroit
Tulsa, Oklahoma
Phone 3-8851

THE R.S.C. TULSA SERVICE ACCURACY

TEXAS BRANCH
917 Santa Fe Bldg.,
Dallas, Texas
Phone 2-1511

Rely on
METALLO
GASKETS

WHAT proportion of the leaks, blowouts, shutdowns, waste and repairs on your high pressure, high temperature lines is due to gasket failure? Let your next gasket be a METALLO, made of finest 14-oz. copper shaped into deep corrugations, each interlaid with high-grade closely woven asbestos cord, each corrugation a tight gasket in itself.

METALLO Refinery Type Gaskets of double-jacketed corrugated steel and asbestos filled, hold on 900 lbs. and 1112 deg. F. All sizes for oils, chemicals and acids.

METALLO VALVE DISCS—copper jacket completely enclosing a filler of heavy compressed asbestos packing—an elastic, resilient cushion on which valve seats close snugly. Try them for 90 days free.

Write for copy of new Metallo Catalogue—handsomely illustrated.

Metallo Gasket Company
New Brunswick, N. J.

FULTON DUPLEX
SENSITIVE VACUUM REGULATOR

On a system discharging gases to a line, under light vacuum, it is sometimes desirable to maintain atmospheric pressure.

For this purpose, we manufacture the DUPLEX VACUUM REGULATOR, which acts as a safeguard when used on the vapor lines connected to storage tanks, for the recovery of the gases, the purpose being to prevent the pulling of a vacuum.

WRITE US FOR FURTHER INFORMATION

CHAPLIN-FULTON MFG. CO.
28-36 Penn Ave., Pittsburgh, Pa.

Synthesis of Petroleum from Coal Gasification Products. — Petroleum products, from benzine to paraffine wax, can be synthesized at atmospheric pressures from gaseous mixtures, which contain carbon monoxide and hydrogen, that is water gas, by passing the gas over a catalyst at moderate temperatures up to approximately 270 degrees C. Finely pulverized metals of the eighth group of the periodic system, which are prepared by reducing their oxides with pure hydrogen at a temperature of 350 degrees C, may be employed as a catalyst alone or in conjunction with metal oxides, for examples the oxides of chromium, zinc, beryllium, etc., and with or without a carrier, for example pumice, asbestos and the like.

With iron alone the reaction is slow; cobalt is more active, but with nickel the main product is methane, which is also the sole product in all cases at higher temperatures. Increasing the basicity of the catalyst by the addition of alkali carbonate or hydroxides increases the proportion of higher boiling products. It is essential that the gases used should be free from sulphur compounds which poison the catalyst, and it may be necessary from time to time to free the latter from clogging by heavy paraffines.

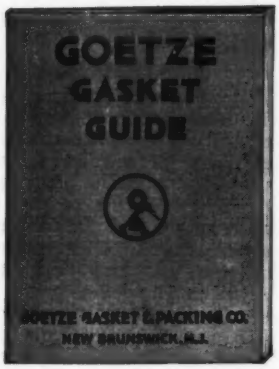
As an example of the yield obtained, one hundred grams of liquid and solid products were recovered by repeatedly circulating one cubic meter of water gas over an iron-copper catalyst. The products included "gasol" (ethane, propane, butane with only traces of olefines), benzine, "petroleum" and paraffine wax. The benzine, extracted from the gases by active charcoal was water white and remained so, and had a density at 15 degrees C. of 0.6718, a calorific value (gross) of 11,360 calories per gram and spontaneous ignition temperature of 335 degrees C. On distillation it gave 18.2 per cent at 50 degrees C, 75.3 per cent at 100 degrees C, 92.3 per cent at 150 degrees C.

The "petroleum" had a density of 0.7804 at a temperature of 20 degrees C, and yielded 4.4 per cent at a temperature of 180 degrees C, 14.4 per cent at a temperature of 200 degrees C, 49.2 per cent at a temperature of 250 degrees C, 70.4 per cent at a temperature of 300 degrees C and 83.2 per cent at a temperature of 330 degrees C. The paraffine wax, recrystallized from acetone, was colorless and odorless and had a freezing point of 61 degrees C. The catalyst is supposed to function by virtue of the intermediate formation of unstable metal carbides of high carbon content. Brennstoff Chemie, 1926, volume 7, pages 97-104.

* * *

Explosive Risk in Crude Oil Storage Tanks.—Samples were taken of the atmospheres which are found in the air space above the crude oil stored in storage tanks. The atmospheres were found to be carburetted with various petro-

GOETZE

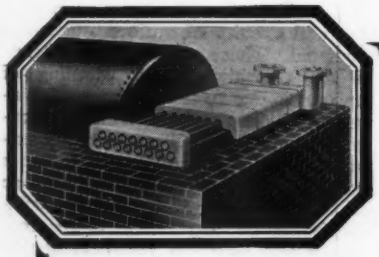


Metal-Asbestos Gaskets *for* Modern Refinery Practice

Write for this 36-page "Guide"

Goetze Gasket & Packing Co.

28 Allen Ave., **New Brunswick, N. Y.**



Marley Super-Heaters

—For Horizonial Return Tubular Boilers

THE many features of the "Marley" Superheater—and particularly its adaptability to installation with your present equipment, makes it the ideal equipment to use. Eliminates the rear arch effects a saving in fuel and insures increased capacity.

Bulletins fully descriptive of "Marley" Superheater for Horizontal Tubular Boilers will be sent to anyone interested upon request. Write today.

Power Plant Equipment Company

2106 GRAND AVE., KANSAS CITY, MO.

Have a Copy Sent to Your Home

Why depend on reading the "Office Copy" when you can get a copy of The REFINER AND NATURAL GASOLINE MANUFACTURER for your own files,—sent to your home each month for

ONLY $1.00 A YEAR

Use the Coupon NOW!

The REFINER and NATURAL GASOLINE MANUFACTURER, Box 1307, Houston, Texas.

Gentlemen: Please find enclosed one dollar (check or currency will do) for which send me your publication for one year.

Name .....

Street and No.....

City ..... State.....

I am with the..... Company

(Refinery Dept.) (Natural Gas Dept.)
(Scratch one) and my position is:

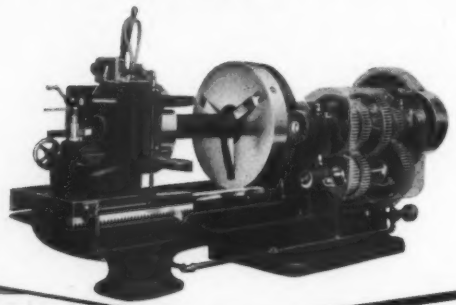
Executive — Chemist
Superintendent — Stillman
Assistant Superintendent — Other Employee

STANDARD
PIPE THREADING MACHINES

They're made for the tough jobs—the harder they come the better Standard Wieland likes them.

Standard's unusually wide chasers—insuring extra long, clean cuts—sturdy construction, and marked absence of confusing parts—are features that will appeal to you.

Let us send you the facts



STANDARD ENGINEERING CO., Ellwood City, Pa.

For Protection

When paint spraying outside work use the New Improved Pulmosan Dustproof Aluminum Respirator.

For painting inside of tanks and tank cars use the Pulmosan Airline Mask with blower attachment.

Write for Descriptive Literature

Pulmosan Safety Equipment Corp.
384 Jay Street Brooklyn, N. Y.

leum ingredients. However under no conditions was an explosive mixture found, the proportion of hydrocarbons in the atmosphere being considerably in excess of the explosive limit. This is an important condition and was found to exist as well in storage tanks which contain petroleum products. Further information on this subject is contained in Journal of the Institute of Petroleum Technologists, 1926, volume 12, pages 336-340.

* * *

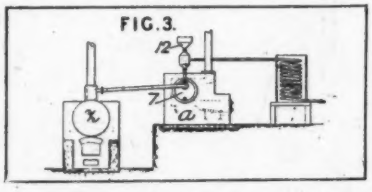
Properties of Paraffine Wax.—Paraffine wax obtained from a Burmah crude oil was found to contain a complete range of paraffine hydrocarbons from $C_{21}H_{44}$ to $C_{31}H_{70}$. A paraffine hydrocarbon having a melting point of 95.5 degrees C and the formula $C_{37}H_{116}$ was also found. Observation on the cooling of wax and its crystallization from a variety of solvents point to the existence of a transition point between two isomeric crystalline forms for each paraffine at a temperature about 10 to 15 degrees centigrade below the melting point of the paraffine. Above the transition point acicular crystals are stable, below it rhombic plates are the stable form.

Wax is more easily separated from mineral oil, if acicular crystals are first formed by slow cooling, followed by rapid chilling. Dirt in suspension does not interfere with the crystallization of wax, but asphaltic material and amorphous mineral jelly have harmful effects. Data for the thermal expansion and density of various waxes are tabulated. These confirm the existence of the transition points. Mottling of the wax is due to the presence of mineral oil or dissolved air. Wax may contain from seven to 10 per cent by volume of dissolved air. A breaking test is described which gives information on refining efficiency. Amorphous mineral jellies and crystalline waxes consist of two different chemical classes of compounds. Journal of the Institue of Petroleum Technologists, 1926, volume 12, pages 288 to 315.

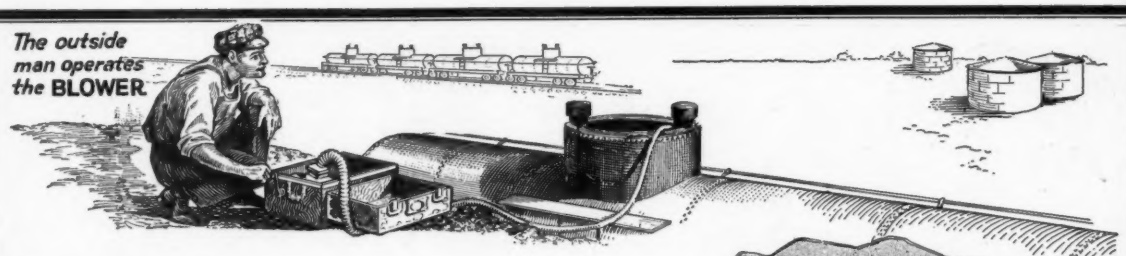
* * *

Cracking Hydrocarbons — Vapors from an oil still z, shown in the accompanying figure, or from an appa-

FIG. 3.



ratus which is used for distilling coal, lignite, or other carbonaceous material, are treated to give a greater yield or low boiling oils or spirit by passing them through a converter which is maintined at a lower temperature than the still or retort and which contains lime, together with zinc oxide or zinc chloride, aluminum chloride, bauxite,



Feed him
FRESH-COOL-AIR

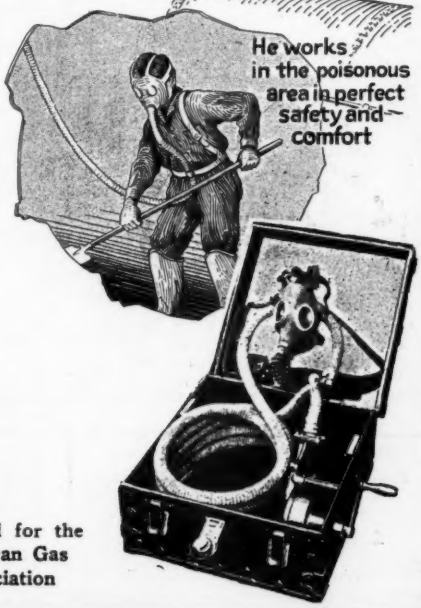
—and he'll work with greater ease, comfort and safety.

The M-S-A Standard
HOSE MASK

Supplies a continuous stream of fresh air to workers in Tank Cars, Oil Tanks, or in any confined gaseous space.

Send for Bulletin No. 99F for complete information on this and other types of Hose Masks

Mine Safety Appliances Co.
Braddock Ave. & Thomas Blvd. Pittsburgh, Pa.



Standard for the American Gas Association

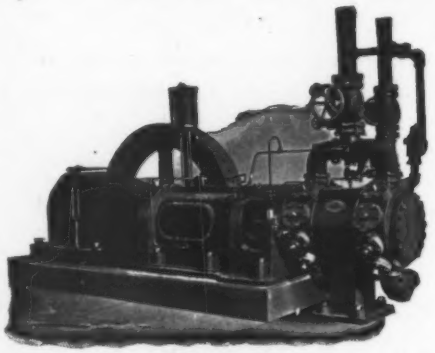
WALSH FIRE BRICK

FROM COAST TO COAST

WALSH FIRE CLAY PRODUCTS CO.

ST. LOUIS
CHICAGO
360 N. MICH. BL.
NEW YORK
220 FIFTH AVE.

Vilter Ammonia Compressors Fittings and Pipe Coils
Render Years of Reliable Service



Compressors built in several types and a great variety of sizes. Illustration is of a high speed type compressor.

Complete Data on Request

THE VILTER MFG. CO.
Established 1867
1152-1162 Clinton St. Milwaukee, Wis.

BRANCH OFFICE
413 Com'l Bank Bldg.
Houston, Texas

Standard Specification Steam
Produces Greater Profits than Ordinary Steam
Write for full information
ANDREWS-BRADSHAW COMPANY
533 Fourth Ave. Pittsburgh, Pa.

For Fullers' Earth, Bentonite, Magnesia Clays, Pumice Dust, China Clays, Kaolin, Brick and Tile Clays, Feldspar, Serpentine, Alabaster, Limestones, Gem Stones, Lignite, and good prospects for oil. Address
J. C. MELCHER,
R. F. D. 4, LaGrange, Texas

A Modern Publishing Establishment

Our equipment is especially adapted to the publishing of books on petroleum, oil field supply catalogues, oil company house organs, booklets, etc.

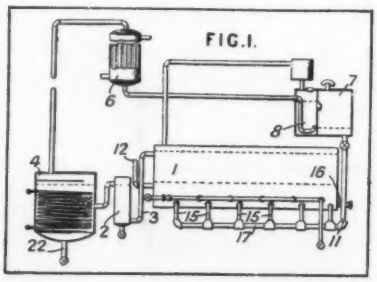
Give us an opportunity to figure on your next printing job.

The Gulf Publishing Company
Dallas Avenue at Chenevert Street
Houston, Texas

magnesia, common salt, charcoal, coke, etc.

The condensate is purified by means of acid and alkali treatment. The converter may be a vertical cylinder containing the materials on trays or holders fitted with agitating blades and heated by the passage of the vapors. Alternatively a horizontal cylinder (7) heated by a separate furnace, a, may be employed. The cylinder (7) is divided by partitions between which are screw plates carried by a cebtral rotary shaft. The converting materials may be passed continuously through the cylinder from an inlet hopper (12) to an outlet valve at the opposite end. If the vapors contain phenols or cresols, the inner surface of the converting chamber is tinned. British Patent No. 254,011.

Extracting Oils—Petroleum, from which the gasoline and kerosene have been removed, is separated into lubricating and other fractions by continuous extraction with alcohol, preferably anhydrous. In the apparatus shown in



the accompany illustration oil flows from a pipe (12) around baffles in a tank (1) while alcohol is admitted from a tank (7) by the pipes (11,17 and 15) and perforated coils, a temperature of about 150 to 170 degrees F being maintained by closed steam coils.

The extract overflows through a pipe (3) to a settling tank (2) for undissolved oil, and on to a still (4) for removing the alcohol to a condenser (6) and the storage tank 7. The alcohol is dehydrated in a chamber (8) of the tank (7) by dehydrated copper sulphate or other hygroscopic material contained in bags, and is returned to the tank (1). The extracted oil is removed through a pipe (22). When, say, 35 per cent of cracking stock or any other desired fraction has been removed the treated oil is run through an outlet (16) to a second similar extraction apparatus and there treated, until, say, 10 per cent of light lubricating oil has been extracted.

It is then passed to a third apparatus in which, say, 35 per cent of lubricating stock is extracted, and into a fourth where about 10 per cent of heavy lubricating oil is removed. The residual 10 per cent, especially if of an asphaltic nature, may be used as a binder. It is preferably blown to increase its con-

METERS

Accurate, dependable instruments for measuring all kinds of oil and liquid oil products. Very durable. Can be kept up to their high initial accuracy for long periods of severe service. Standard and high pressure models. Special meters for special work.

The EMPIRE

Positive displacement, oscillating piston design. Quite different from all other types of oil meters. Easy to install and care for. Economical to maintain.

MADE IN ALL SIZES FROM 5/8 to 6 INCHES INCLUSIVE

Send for descriptive circular 110-R.

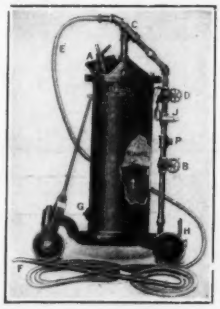
NATIONAL METER COMPANY

299 Broadway, New York

Chicago Boston Cincinnati Atlanta San Francisco Los Angeles

$2,800.00 Saved in Two Months

With One QUIGLEY REFRACTORY GUN



One large company, using the Gun to apply refractory mixtures to the arches, side walls, fire walls and bridge walls in 7 of their boilers, writes that they couldn't get a good job until they tried the Quigley Refractory Gun—and then—they not only got a much better job, but they saved $400.00 net per boiler after two months use.

THE QUIGLEY REFRACTORY GUN

shoots premixed plastic refractory materials such as Hytempite and aggregates with high velocity at any place in walls or arches of furnaces and stills, also fills cracks, restores burned out walls or surfaces new ones, repairs or builds baffles, patches retorts, kilns, etc.

HYTEMPITE

HYTEMPITE "The Standard for Comparison" in high temperature Cements is used for Laying Fire Brick and Tile, Repairing and Building Furnaces, Making Monolithic Baffles, Special Shapes, Etc.

Quigley Furnace Specialties Co., *Inc.*

26 Cortlandt Street New York City

Stock and Service in Every Oil Field and Industrial Center

Say you saw it in The OIL WEEKLY

Oil Testing Instruments

Complete Stocks
Standard Equipment

Refinery and Gasoline Plant Specialties

Laboratory Apparatus.

Scientific Instruments

Greene Brothers

Wichita Falls
Dallas
Texas

sistency. The extracted oils are freed from paraffin by chilling, from alcohol by heating and from other impurities by steam or acid or acid-clay treatment.

The flow of oil through the extraction units may be continuous if the quantity and the rate of distillation of the alcohol in each unit be suitably adjusted. The crude red oil stock extracted by the third apparatus may be treated in a supplementary apparatus with alcohol at about 130 degrees F. to dissolve out lighter oil and so increase its viscosity. The alcohol may be made anhydrous initially by treatment first with lime and then with dehydrated copper sulphate. British Patent No. 254,784.

* * *

Improving Lubricating Efficiency of Oils—A study was made on improving the lubricating efficiency of oils by graphite as reported in Kolloid Zeitung, 1926, volume 39, pages 334-6. The parallelism between lubricating efficiency and heat of wetting previously demonstrated is applied to explain the improved efficiency of oils to which graphite, especially colloida graphite, has been added. Measurements show that the wetting heat oil-graphite is with a good oil seven to ten times greater than that of oil-metal. The graphite forms a layer on the surface of the metal so that the efficiency of the lubricant is determined by the wetting heat of oil-graphite. Almost all the oils investigated (good and bad) show the same wetting heat against graphite, so that they are all raised to the same efficiency by its addition. The improvement brought about by the addition of a small percentage of an unsaturated fatty acid is also explained by the elevation of the heat of wetting which it causes.

* * *

Progress in Naphthology—The August, 1926, issue of the Journal of the Institution of Petroleum Technologists is given over in its entirety to a discussion of the progress made in the technology of the oil industry in all its branches. The symposium is concerned with the progress made during 1925. It deals with all the various phases of the oil industry, starting with oil field methods, dealing in detail with drilling methods and tools, and also considering such subjects as retortable oil yielding material, oil shale, refining, developments in American petroleum refining, cracking, lubricants, special products, such as activated carbon, paraffin wax, oxidation products of petroleum, chlorine compounds of petroleum, analysis and testing of petroleum, oil and gas developments in Canada in the British West Indies, in Japan, production of oil shale and shale oil in Esthonia and finally with the world's production of petroleum.

BURRELL

OBERFELL IMPROVED Gas Testing Apparatus
(PATENTED)

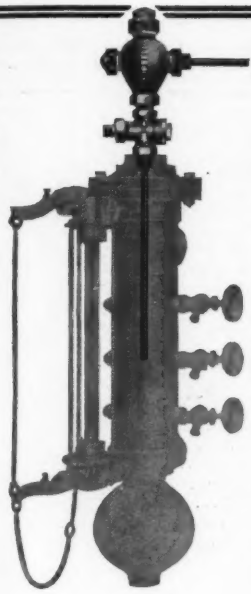
PORTABLE ACCURATE

THE RECOGNIZED STANDARD
For Determining Gasoline Content—Specific Gravity—Volume of Natural Gas
Catalogue J sent on request
Burrell Technical Supply Co.
1704-1708 Fifth Ave.
PITTSBURGH, PENNA.

Electrically Driven Centrifuges
Hand Centrifuges
WRITE
WILLIAMS, BROWN & EARLE, Inc.
Manufacturers of Laboratory Apparatus
918 Chestnut St. Philadelphia, Pa.

WANTED—Steel Salesman and demonstrator with some metallurgical training, to represent in the Oil Well district a manufacturer of high grade steel. Man must have some technical training and furnish satisfactory references. Box 422, care The Refiner and Natural Gasoline Manufacturer.

"PETROLEUM CHEMIST OR CHEMICAL ENGINEER required for research, progress and experimental development work on plant scale at large refinery in the East. Must have University degree and at least three years experience of Petroleum refining and laboratory work. Younger men preferred. Write giving full particulars including age, education and experience (state which cracking or other special processes familiar with) and list of references to Box No. 926, care the Refiner."

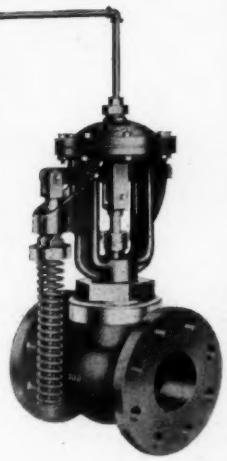


A Quarter Inch Brass Pipe Connection

The CAMPBELL
BOILER FEED-WATER REGULATOR

SEE how easily this Regulator is installed. Attach to any water column through the top, at the side, through the try cock connection or any place on the boiler at the water line.

THE Control Valve can be placed in feed-water line in any position or anywhere, between pump and boiler. If operating only one boiler it can be placed on steam line to pump.



You Can't Beat the CAMPBELL for simplicity, dependability, accuracy, economy, or anything else. No floats, no links, no thermostats, no generators—nothing to get out of order.

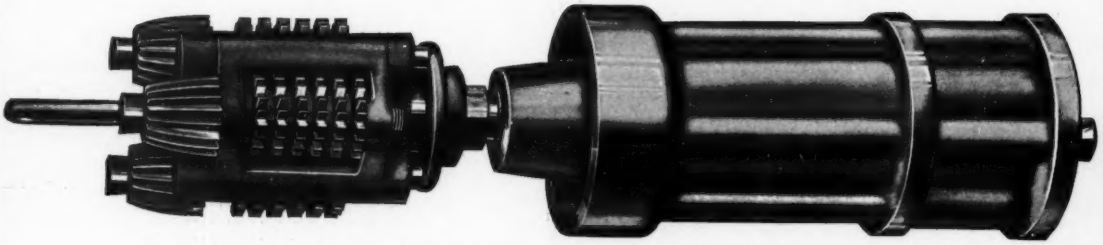
For Safety Unexcelled.
Also a fuel saver.

SOLD ON A GUARANTEE OF SATISFACTION
After 60 Days Trial. Ask for descriptive literature

GEO. B. ALLAN & CO.
SIMPSON BLDG. DALLAS, TEXAS

CASH STANDARD Reducing and Regulating Valves also for high pressures and temperatures—Pressure and Vacuum Valves—Pump Governors—Automatic Ammonia Control Valves.
CROSBY STEAM GAGES AND VALVES—ECKENROTH Automatic Reseating Blow-Off Valves, Steam and Air Separators—Steam Strainers—Centrifix Steam Purifiers.
VULCAN SOOT BLOWERS for all types of steam boilers, superheaters and economizers.
DALLAS STOCK of ARMSTRONG STEAM TRAPS—KELLY SELF-GRINDING VALVES—MARLEY NON-CLOG SPRAY NOZZLES—HAYS DRAFT GAUGES—Promet Bearing Metal.

An Important Announcement



Roto Air-Driven Heavy Duty Cleaner

THE ROTO COMPANY IS MOVING

November 1, 1926, from its present quarters at Hartford, Conn., to its new and larger home located at

SUSSEX AVENUE & NEWARK STREET, NEWARK, N. J.

where production will be materially increased and where shipping facilities will make possible much quicker service to the many users of Roto Cleaners throughout the country.

GARLOCK
TRADE MARK

Garlock
Complete
Packing Service

THE GARLOCK PACKING COMPANY
PALMYRA, N.Y.

The Standard Packing of the World

SEE OUR EXHIBIT AT BOOTH No. 505
POWER SHOW—NEW YORK CITY—DECEMBER 6th to 11th, 1926

Advertisers Index

American Cast Iron Pipe Company 61
American Paint & Supply Company 10
American Radiator Company . . . . . *
Andrews Bradshaw Company 86
American Schaeffer & Budenburg Corporation 72
Geo. B. Allan Company 89
Association of Natural Gasoline Manufacturers 39
Banner Rock Products Company 47
Bessemer Gas Engine Company 4
Botfield Refractories Company 63
C. F. Braun & Company . . . . . Inside front cove and page 3
Bristol Company 76
Bruce-MacBeth Engine Co. 41
Burrell Technical Supply Company 88
Celite Products Company . . . . . Front cover
Chestnut & Smith Corporation 77
Chicago Bridge & Iron Company . . . . . *
C. & G. Cooper Company 20
Chaplin Fulton Manufacturing Company 82
Clark Brothers Company . . . . . *
Detroit Graphite Company 73
Edward Valve & Mfg. Company . . . . . *
Elliott Company 59
Fisher Governor Company 69
Fort Worth Laboratories . . . . . *
Foxboro Company, Inc. 72
Garlock Packing Company 90
General American Tank Car Corporation . . . . . *
Goetze Gasket & Packing Company 83
Graver Corporation 51
Greene Bros. 88
Griscom-Russell Company 13
A. L. Henderer's Sons 14
Hill, Hubbell and Co. 43
Hills-McCanna Company . . . . . *
Johns-Manville, Inc. 9
Kaw Steel Construction Company 18
M. W. Kellogg Company 16
Kerotest Mfg. Company 22
Lagonda Manufacturing Company 12
Liberty Manufacturing Company . . . . . *
Walter E. Lummus Company . . . . . *
Lunkenheimer Company 15
Maintenance Engineering Corporation . . . . . *
A. Y. McDonald Manufacturing Company . . . . . Back cover
Arthur G. McKee Co. . . . . *
J. C. Melcher 86
Metallo Gasket Company 82
Metric Metal Works 8
Lee B. Mettler Company 76
Midwest Piping & Supply Company 67
Mine Safety Appliance Company 85
National Meter Company 87
North American Car Company 79
Oil Conservation Engineering Company 6
Pennsylvania Forge Company 71
Pittsburgh Steel Products Co. 5
Plibrico Jointless Firebrick Company . . . . . Inside back cover
Power Piping Company 80
Power Plant Equipment Co. 83
Power Specialty Company 65
Pulmosan Safety Equipment Company 84
Quigley Furnace Specialties Company 87
Refinery Supply Company 81
Roto Company 89
Southern Cornice Works 80
Southwestern Engineering Corporation 14
A. O. Smith Corporation 11
Standard Engineering Company 84
Struthers-Wells Co. 37
Sun Company 57
C. J. Tagliabue Manufacturing Company . . . . . *
The Texas Company 7
Texas Fire Brick Manufacturers' Assn. 75
United Iron Works . . . . . *
Universal Oil Products Company 55
Vilter Manufacturing Company 86
Henry Vogt Machine Company 17
Walsh Fire Clay Products Company 85
Ward Chemical Company 85
Westcott & Greis 53
Western Iron & Foundry Co. . . . . *
Wheeler Condenser Co. 43
Widdell Engineering Company . . . . . *
Williams, Brown & Earle, Inc. 88
D. T. Williams Valve Company . . . . . *
Winkler & Koch . . . . . *
York Manufacturing Company 75

over 19,000 users of PLIBRICO furnace lining

ISN'T that evidence of superiority? The reason? Plibrico lasts at least 100% longer than firebrick.

Often it outlasts firebrick three, four, five and six times.

No joints—that's why!

And it makes several other economies, such as cutting heat loss through the setting and eliminating special shapes. Your own men can install it.

Try this plastic, jointless furnace lining for repairing still or boiler furnaces. You'll want to use it for a front, or for complete relining. We'll gladly send an engineer to figure on your repairing and to bring you the big book. Engineers, warehouse stocks and installation crews in 85 cities.

PLIBRICO JOINTLESS FIREBRICK CO.

World's Largest Manufacturers of Plastic Linings

1865 KINGSBURY STREET, CHICAGO

Factories: Chicago and Trenton, N. J.

McDonald Swing Joint Patented 7-2 1912

LEAK-PROOF FREE MOTION

Absolute flexibility—freedom and ease of motion plus guaranteed leak-proof construction are yours in McDonald Swing Joints.

7 and 8 years of service without repacking is not unusual for McDonald Swing Joints. Only a specially prepared packing is used which is highly resistant to the action of gasoline and oils. Yet McDonalds are so designed that, when necessary, they can be repacked quickly and easily.

All parts are strong and heavy—practically a lifetime proposition. Made in single and double styles and sizes from ¾" to 12 inches. Specify McDonald Swing Joints and know why they are used all over the world.

"The Home of the Swing Joint"

A. Y. McDONALD MFG. COMPANY

Dubuque, Iowa

Omaha Minneapolis Des Moines Kansas City

There's a McDonald Distributor Near You

McDONALD